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DIVISION OF ENTOMOLOGY

BULLETIN NO. 2

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

# Notes on Some Fijian Insects.

BY F. MUIR

HONOLULU, H. T.
NOV. 10, 1906

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HONOLULU, H. T
1906

# LETTER OF TRANSMITTAL.

To the Committee on Experiment Station,
H. S. P. A., Honolulu, T. H.

Gentlemen:

I, herewith, submit for publication Bulletin II of the Division of Entomology. It is entitled "Notes on some Fijian Insects," and was written by Mr. F. Muir, on his return from Fiji.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

Honolulu, T. H., October 11th, 1906.

# GENERAL ACCOUNT OF MISSION TO FIJI.

The primary object of my visit to Fiji being the investigation of the economic conditions of Leaf-hopper in the sugar-cane fields, I found that I could not make Suva my headquarters as the nearest sugar plantation was some twelve miles away, so I moved up to Rewa.

In January, 1906, I visited Ba, on the northern side of the island, and in February spent a few days at Navua, on the south-west side. Rewa and Navua are "wet" districts with a rainfall from 110 to 130 inches per year, whilst Ba is dry. I arrived in Fiji at the end of one of the worst droughts that Fijians could remember, the northern side of the island being very dry; but the drought broke in January and during the latter part of my stay collecting was difficult on account of heavy rains and breeding insects was made nearly impossible on account of mould induced by the excessively damp weather.

The Fijian sugar cane leaf-hopper (*Perkinsiella vitiensis*) I found all over the island, but it does no damage, being kept in check by several natural enemies.

The most important of these are the egg-parasites, *Ootetrastichus, Anagrus* and *Paranagrus*. The first of these was introduced from Fiji into Hawaii by Mr. Koebele, and the other two appear to me the same as the Queensland species. In some fields as many as 90% of the hopper eggs were parasitized, but in other fields it was lower. Observations extending over my six months' stay, and made at the various parts of the island visited, show that an average of 85% of hopper eggs were destroyed by these parasites. These figures are only approximate, as I have to estimate that one Chalcid (*Ootetrastichus*) destroys four hopper eggs, which is a low estimate. This Chalcid is more numerous, and on account of destroying the whole batch of hopper eggs, is of very much higher economic value than the Mymarids.

As these parasites had already been introduced in Hawaii, I did not lay myself out to send more, but only sent them along with other insects as opportunity offered.

The parasite next in economic value is a Stylopid (*Elenchus tenuicornis*). This I found attacking young and adults on all the plantations I visited. In one field of cane about ten to twelve months old, as many as 70% of the hoppers were stylopized, but the true average must be higher, as many of the unstylopized hoppers would develop parasites later.

I made every effort to introduce this into Honolulu and sent five cages of stylopized hoppers to Honolulu. Whether they will attack * *P. saccharicida* or not remains to be seen.

Owing to our ignorance of the habits of these insects, especially in the early stage, they were exceedingly difficult to handle.

A species of *Gonatopus* was also found attacking *P. vitiensis,* especially on the northern, or dry, side of the island. Several consignments of this insect were forwarded, some in cold storage and some in cages on living cane. Although it was nowhere abundant, young hoppers being scarce, yet I hope it will prove of value if once established here.

These were the only parasites I could find upon *P. vitiensis,* the predators being somewhat similar to those in the Hawaiian Islands. Spiders of several species, earwigs and ladybirds, predominate.

Of the ladybirds, *Verania strigula* was most frequently found in sugar-cane fields, and I forwarded several boxes to Honolulu. In captivity it fed upon young *P. vitiensis. Anisorcus affinis* I never found in cane-fields, but as it is a most useful enemy of scale (*Chionaspis*), I forwarded several packages. It is not a hardy insect and soon dies in captivity. A large yellow ladybird, *Archaioneda tricolor*, var. *vitiensis*, I also sent, as it ravenously devoured aphis and also a white scale.

A great deal of time was spent in investigating the cane borer (*Sphenophorus obscurus*) to find out what was responsible for its decrease. Thanks to the kindness of Mr. Fenner, of the Colonial Sugar Refining Company, and individual planters on the Rewa, I was enabled to open hundreds of bored stems and stools, but I failed to find any parasites on egg, larva, pupa or adult, or to find any reason why this beetle has decreased since Mr. Koebele visited Fiji in 1892. A fungus kills a small number of pupae, but it is rare. The borer is still numerous and in places much worse than I observed it on the plantations most affected on Oahu.

The introduction of a harder variety of cane is believed, by the majority of Fijian planters, to be the chief reason of the decrease; but if this be so, it took some time to be apparent, as the hard varieties were introduced some time before the borer was noticed to have decreased. With the hard varieties of cane it would take the young larva longer to entirely conceal itself in the cane, and thus it would be exposed to the attacks of ants for a longer period. Ants are abundant and in wet fields make their nests between the leaf and the stem of the cane. It is interesting to note that with the reintroduction of soft varieties of cane the borer is apparently on the increase, or at least its attacks are more severe.

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* As stated below in this Bulletin, it was found that they would not do so.

I examined the Pandanus palms, cocoanut palms and other native trees, in which this beetle lives, but was unsuccessful in my search for parasites.

*Aleyrodes bergii* was very abundant in some fields, a fungus being the chief agent in its destruction. Fungi I found to be one of the chief factors in destroying many noxious insects, especially scale.

Such time as I could spare from breeding and shipping insects, I devoted to a general collection, especially of economic insects, which I trust will be of interest when worked out.

A species of slug, a *Vaginula,* very similar to the one found in the Hawaiian Islands, has been a garden pest for several years in Fiji, but, until this year, it was never known to attack sugar-cane. This year it attacked some fields of young seed cane, eating the leaves and destroying the eyes and a great deal of replanting had to be done in these fields in consequence.

The increase of these slugs in sugar cane fields I attribute to the use of "Mauritius bean" as a green manure. These slugs are very fond of this plant for food, and the shade of its leaves makes an attractive breeding ground. When the plant is ploughed in, only a few of the slugs are killed and hundreds of eggs are left to hatch out. The young slugs, finding no other food but sugar cane, attack the young shoots and eyes.

Should "Mauritius bean" be used in the wet districts of the Hawaiian Islands as a green manure, watch should be kept upon the local species of *Vaginula* to see if it increases in the cane fields. Leaving a row of Mauritius beans every two chains or so, until such time as the young cane is beyond attack, might be beneficial.

Lantana is very abundant around Suva, but it does not appear to grow so luxuriantly as in the Hawaiian Islands, though another plant, locally known as "Koester's curse" (*Clidemia hirta*) is very bad in the Rewa district, overrunning all grazing lands.

As an illustration of the manner in which insects can be imported into a country, in spite of every precaution taken by inspectors and custom authorities, I may mention a case that came under my observation on board R. M. S. "Maheno" on my return passage. A passenger bought two or three stalks of cane in Suva and stored them in the alley-way on board. Two days after leaving Suva I took three adult Fijian cane leaf hoppers (*P. vitiensis*) off them, two females and one male; during the next two or three days several young hoppers hatched out. The day before arriving at Honolulu I stripped the few remaining leaves off the cane and found two more young hoppers.

My work in Fiji was greatly facilitated by the kindness of Mr. F. W. Fenner, Manager of the Colonial Sugar Refining Company, Nausori, Mr. Fordham Jonson of the Vancouver Fiji Sugar Company, and members of the Fijian Planters' Association, especially Mr. J. L. Hunt, of Koronoveh, in whose fields I did most of my collecting. Mr. Duncan, Manager of the Canadian-Australian S. S. Mail Co., kindly gave me every facility for shipping insects to Honolulu.

## NOTES ON STYLOPID AND DIPTEROUS PARASITES IN FIJI.

### (1) *ELENCHUS TENUICORNIS.*

This insect I found in Fiji parasitic upon the Vitian cane leaf hopper (*Perkinsiella vitiensis*) and several other species of Delphacids. Its economic value I estimated highly, as a large percentage of young and adult leaf hoppers were stylopized. I therefore made great efforts to introduce it, hoping that, as its hosts were so varied, it would attach itself to the Hawaiian cane leaf hopper (*P. saccharicida*). This hope was not fulfilled, as *P. saccharicida* proved immune from the attacks of *Elenchus*. Two or three generations of *Elenchus* were reared upon *P. vitiensis* in cages containing also *P. saccharicida*, and stylopized *Aloha ipomoeae* were enclosed with the latter, but these never developed parasites. Eventually I dissected a great number of *P. saccharicida*, that died in the breeding cages, and in two I found single specimens of triungulins that had never developed. This indicates that a great pathological difference exists between *P. saccharicida* and *P. vitiensis,* a difference that would not be expected from the similarity of their external characters. Mr. G. W. Kirkaldy, however, informs me that the males of these leafhoppers differ greatly in the form of their genitalia.

As it was necessary, when in Fiji, to get together as large colonies as possible for shipping to Honolulu, I could not destroy living hoppers for dissection and follow the larval changes as closely as I wished.

Upon my return to Honolulu I was informed by Mr. W. M. Giffard, that he had discovered *E. tenuicornis*, parasitic upon *Aloha ipomoeae,* at an elevation of 1300 feet on Mount Tantalus. He kindly procured me some fresh specimens, which enabled me to verify several points in the economy of these little insects.

It should be noted that Mr. A. Koebele introduced an American *Elenchus* into the Hawaiian Islands in 1903, which failed to establish itself upon *P. saccharicida*. Evidently it took to *A. ipomoeae* for I cannot believe that this parasite existed in the islands prior to that date, or Messrs. Perkins and Giffard would have detected it when collecting on Tantalus.

In the breeding jars the adult males hatched out in the early morning, between sunrise and 7. a. m., and were dead before midday. They are very feeble upon their legs and keep their wings in rapid vibration all the time they are walking. When on the wing they take up a perpendicular position with their antennae erect, and the tip of their abdomen turned slightly under. In this position they hover very steadily around the sugar-cane stalks and along the leaves, seeking leaf hoppers bearing female *Elenchus*. Sight seems to be the chief sense by which they detect the presence of the leaf hoppers, as I have seen one hovering along one side of a leaf with half a dozen stylopized hoppers on the other side, only a quarter of an inch away, and apparently not knowing of their presence, but should a hopper but show its antennae over the edge of the leaf the *Elenchus* darts towards it and hovers over its back. If the hopper bears a mature female parasite, the male settles about half an inch away and crawls towards the hopper, vibrating its wings all the time. This generally disturbs the hopper and it moves off, the *Elenchus* following till it gets a chance to spring upon its back and attach itself to the female. This action disturbs the hopper and it flicks its abdomen to shake off the parasite. Except on these occasions, the hopper appears to have no antipathy towards *Elenchus* and is never disturbed by its presence, as *Polistes* is reported to be by *Xenos*. I have never seen the male *Elenchus* retain its hold of the female for more than six seconds, generally it is attached only two or three seconds. I am unable to say if fecundation takes place during this time or exactly how copulation takes place; evidently the tip of the abdomen is inserted into the brood-chamber.

In captivity the larvae of the first stage, triungulins, never lived longer than twenty-four hours, numbers being drowned in the moisture upon the glass sides of the breeding jars; moisture upon the leaves does not appear to have such a fatal effect upon them. No doubt under more favorable conditions in the open air the triungulins are able to exist for a much longer period before entering their hosts.

The method by which the triungulins enter their hosts I was not able to observe. When they have entered their host and embedded themselves among the fat bodies of the abdomen or thorax they begin to swell and histolysis sets up, the skin splits along the back and a legless grub emerges. The larva at this, second, stage, is like a small sack filled with a creamy substance that reminds one of the pronymph of Muscids; it is thicker at the anterior end, has no trace of legs or ventral protuberances and no visible trophi. The alimentary tract can be distinguished as a fine tube, but I have been unable to trace it to an anterior or posterior opening; it is apparently functionless and nourishment is obtained through the hypodermis. Two dark pigmented spots are visible below the surface from which the imaginal eyes eventually arise.

The size to which the larva grows depends upon the amount of space and food it receives. One female, the only parasite in a female *P. vitiensis,* filled the entire abdominal and thoracic cavity. Generally there are several parasites in the same host, one containing as many as fourteen of various sizes. As the male larva increases in size, the integument becomes slightly chitinized and the mouth parts became visible. In the next larval stage that I have been able to trace, which I will term the third, the anterior end is greatly constricted and the form similar to the puparium. The imaginal eyes are greatly advanced and the imaginal discs of the thoracic appendages distinguishable. Two larvae at this stage had the mouth parts so very distinct that I doubted if they could be *E. tenuicornis,* but as during my six months' stay in Fiji I found only two parasites upon the adult or larval *P. vitiensis,* I am forced to believe that they are a larval form of this Stylopid. These are figured in Figs. 1, 2 and 3 and explain the mouth parts visible on the head-cap of the male puparium (Fig. 4).

The puparium (Fig. 5) is homologous to that of Muscids, being the skin of the instar preceding the pupal stage, whether that instar be called larval, pseudo-pupal or coarctate-larval. A skin is often found attached to the posterior end of the puparium showing that an ecdysis takes place at that stage.

All the cephalic and thoracic appendages of the adult can be distinguished in the pupa before the anterior end of the puparium is pushed through the pleura of the host.

Across the dorsal surface of the cephalic cap of the male puparium, below the labium, runs a depression, the segmental division between the head and prothorax (Fig. 4). In the female a folding back of the labium and adjoining parts forms an opening at this spot leading to the brood-chamber (Fig. 6).

At an early stage before the apical cap of the puparium is exerted, this segmental depression is distinct all round and the prothoracic spiracles are plainly visible; thus we see that the earlier writers were correct in calling the exserted part of the insect the cephalothorax. In *Xenos* the opening of the brood-chamber appears to be anterior to that in *Elenchus*. This appearance is evidently due to the flattening of the cephalothorax and forward growth of the prothorax.

The female larva in the second stage can be distinguished, whilst still very small, by the presence of what Brues terms the primitive eggs, at first indefinite areas along the back, but eventually becoming scattered about among the fatbodies. The head of the adult female never leaves the apical cap of the puparium, but the abdomen, distended to an enormous extent by the number of eggs, bursts through the dorsal side of the puparium. The skin of the puparium remains attached to the ventral side of the insect and forms the brood-chamber (Fig. 7). Three ducts open into the brood-chamber, through which I have found triungulins issuing (Fig. 8). Through one or more of these ducts fecundation must take place, but as the eggs all develop simultaneously the spermatozoa must become dispersed among the fatbodies.

The cephalic cap of the female and male puparium are homologous. In the female the labium and other mouth parts are turned under at an acute angle, leaving a hole which forms the entrance to the brood-chamber. At each side of this hole the prothoracic stigmata are visible.

I have not been able to dissect the adult female *Elenchus* free from the cephalic cap, but in a species of *Xenos*, attacking a species of *Polistes* in Honolulu, I have dissected the adult female free from the puparium. It can then be seen that the mouth parts are more like those of the male larva than of the adult male; and we might say that the female development is arrested at the larval or perhaps pupal stage. The female head when dissected out from the apical cap is interesting, as it tends to confirm Dr. R. C. L. Perkins' interpretation of the position of the mouth opening of the male.

The fact that histolysis reduces the muscular system of *Elenchus* larvae more thoroughly than in any other genus of Stylopidae, that the female is less differentiated, that the male antennae are reduced to two branches, its tarsi to two joints, indicates that this genus is the most specialized of the Stylopidae.

Opinions differ as to the effect of stylopization on the host. Dr. R. C. L. Perkins gave me a dissection of a *Polistes* bearing two full grown female *Xenos* and several larvae, in which the internal organs of the *Polistes* were in perfect condition. In the case of the Vitian leaf hopper stylopization had a very harmful effect. The host only lived a short time after a male *Elenchus* hatched out or the young left the brood-chamber of the female. A stylopized female hopper seldom could produce eggs on account of the damage to her ovarian tubes. Over thirty per cent. of *P. vitiensis* were stylopized, and quite forty per cent. of the parasites were males.

## (2) *PIPUNCULUS.*

The parasitic flies of the genus *Pipunculus* appear to be very scarce in Fiji, as compared with Australia, where Koebele and Perkins found them abundantly in all localities. The following very distinct new species was, however, obtained:

### *Pipunculus vitiensis,* sp. nov.

Male. Face, frontal triangle and occiput, black with whitish tomentum; sparse near vertex, denser below; antennae yellow with apex bluntly pointed.

Thorax black; mesonotum shining, without tomentum, pleura and metanotum with whitish tomentum; wings clear, iridescent, with dark neuration, stigma yellowish brown, enclosed basally by a strong cross-vein beyond termination of mediastinal vein, posterior cross-vein before the apex of second longitudinal, third costal area longer than fourth; halteres yellow; legs uniformly yellow.

Abdomen yellow, last segment and hypopygium black, sparsely covered with black hairs; basal segment with three or four bristles on each side.

Dried specimens appear to have a black band upon second segment not noticeable in fresh specimens, evidently caused by the dried up viscera.

Length, 3 mm.

Female. Head black; face with whitish tomentum, front with whitish tomentum at base of antennae and along frontal orbits; whitish tomentum very sparse on occiput near vertex; denser below.

Thorax lighter than in male, dorsum more inclined to brown, and pleura yellowish fuscous with whitish tomentum.

Abdomen and ovipositor yellow, the two posterior tergites fuscous. Length, excluding ovipositor, 2½ mm.

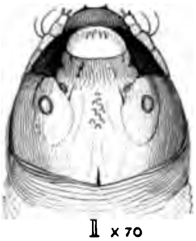
HAB. Rewa, Fiji. A male and female taken together from boughs of trees, so that, like *P. heterostigmus,* it probably attacks arboreal leaf hoppers.

The stigma being enclosed basally by a cross-vein, places this species near *P. heterostigmus,* Perk., but it can be at once distinguished by the shining thorax and yellow legs.

## DESCRIPTION OF PLATE NO. I.

1. Head of Elenchus larva, dorsal view.
2. Head of Elenchus larva, front view.
3. Head of Elenchus larva, side view.
4. Cephalothorax or cephalic cap, of male puparium, front view.
5. Male puparium, side view.
6. Cephalothorax of female.
7. Adult female, side view, with puparium skin attached.
8. Longitudinal section through female, diagrammatic.

BULLETIN II.



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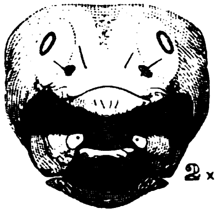

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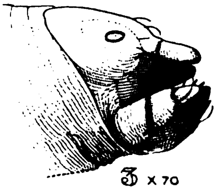

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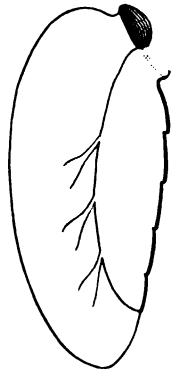

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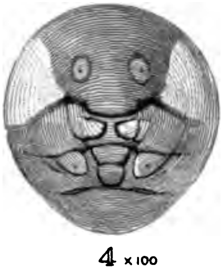

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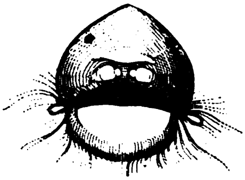

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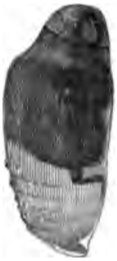

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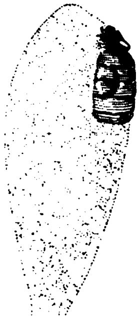

7 x 16

PLATE I.

ALREADY PUBLISHED

Bulletin I.—"Leaf-hoppers and their Natural Enemies," pp. 1-499 + xxxii, with 38 Plates and 10 text figures .......................................... Price $10.00

brown or ferruginous below, the tarsi clear yellowish-testaceous, with the basal joint darker brown.

Antennae long and slender, slightly longer than the whole thorax, all the joints elongate, the very long third joint being one and two-thirds the length of the fourth, the latter above five times as long as wide, the penultimate joint fully twice as long as its greatest width; only the scape pale-coloured. Head conspicuously concave above, dull, with excessively dense minute puncturation; raised median line extending forward from the front ocellus, distinct. Pronotum with very minute close punctures, the transverse sulcature deep, the anterior of the two divisions so formed, not half as long as the posterior one; mesonotal constriction slender, elongate, about twice as long as its greatest width, densely minutely punctate or shagreened, posteriorly with some fine transverse wrinkles; the whole thorax with conspicuous, scattered, erect, pale hairs. Front legs with the basal and fourth tarsal joints nearly equal, chelae of the usual type of Jassid parasites, the lamellate denticles of fifth tarsal joint well-developed nearly reaching the articular cavity; the claw moderately curved with some widely separated, pointed denticles projecting from the median groove between the ridges. All the legs are conspicuously, but not densely, clothed with pale erect hairs. Abdomen very dull, impunctate, clothed with longish erect sparse hairs like those on the thorax. Length 5:5 mm.

HAB. Nogales, Arizona; larva pupated from parasitized Jassid nymph on willow 14.IX.06; bred 20.XI.06; number 2480.

### 7. *Chalcogonatopus frequens* sp. nov.

Ferruginous, the apical abdominal segments sometimes darker brown or blackish, posterior and intermediate femora concolorous throughout, not black apically, antennae more or less pale on the basal joints, the first three generally yellow, but sometimes only the second is distinctly yellow, the scape and third joint being brown, the fourth and following may also be obscurely yellowish, the apical joints being black. Abdominal petiole always black.

Head dull, with close minute puncturation, the antennae slender and of moderate length, no joint being transverse, the third joint one and two-thirds the length of the fourth, the penultimate one and a half times as long as its width. Pronotum smooth and shining, with very sparse, short, erect hairs in fresh examples, mesonotal constriction longer than broad, propodeum variable in sculpture, dull and with close sculpture very distinct in some, in others with the surface smoother and shining, posteriorly with some excessively fine transverse wrinkles. The surface is always pilose, the hairs being short, sparse and fine, but erect or suberect. Front legs with the first and fourth tarsal joints not differing much in length, the chelar claw very strongly curved; row of lamellate denticles of fifth tarsal joint occupying only a short ridge, which begins about the middle of the length of the joint from the articulation of the claw, and is not one-third of the whole length of the joint beneath; outside there is a row of a few shorter and stouter teeth, variable in number, one or two of which are placed nearer to the articulating cavity, while starting from the apex of this cavity there is a sharp raised ridge. As usual, setae are present in addition to the denticles, and there is the usual cluster of the latter on the curved tip. Abdomen smooth and shining. Length 2.5—4 mm.

This species varies considerably in size as the above measurements show. The depth of colour also varies. In sculpture it does not vary much, except that the propodeum is distinctly shining in some examples, dull in others, and there are intermediate conditions. The form and armature of the chelae is alike in specimens exhibiting the above variations.

HAB. Nogales, Arizona; a fine series was captured on weeds at the end of August and in September.

### 8. *Chalcogonatopus solitarius* sp. nov.

Dull, reddish brown, the several apical joints of the antennae black, the three basal joints clear ferruginous, the two or three following more or less obscurely pale; abdominal petiole black; basal joint of front tarsi concolorous with the tibiae or almost so; posterior femora concolorous (at most a little darker at extreme apex), their apical part not being pale yellow.

Head very little concave above, the eyes not very strongly convergent towards the front, dull, with excessively dense and fine rough sculpture, which under the microscope appears to be formed of a mixture of rugulosity and the usual dense punctuation. Antennae shortish, the third joint equal to one and a half times the length of the fourth, the latter subequal to the second, and hardly more than twice as long as wide at apex: penultimate joint scarcely longer than wide. Pronotum dull and closely punctate in front of the transverse furrow, and also immediately behind this, where is a somewhat flattened area, the posterior lobe being broader than in most species, and smooth and shining on its posterior part; mesonotal constriction short, as wide or wider than long; propodeum shortly pilose, as is the pronotum, dull, with dense minute puncturation or surface sculpture, posteriorly transversely rugose, a very faint median impressed line on the disc. Front legs stout, the femora very strongly dilated, the trochanters dilating from the base and so without a distinct basal stalk. Abdomen with sparse pale hairs, the apical margins of the segments paler than the ground color. Length 4 mm.

HAB. Nogales, Arizona; one female collected from weeds in September.

### 9. *Chalcogonatopus echo* sp. nov.

Head, pronotum and legs ferruginous or testaceous, two basal and more or less of the third joint of the antennae yellow, rest of thorax and abdomen black, pronotum more or less darkened at the sides, posterior tibiae darker apically.

Head moderately, but distinctly, concave above, the surface hardly shining, the sculpture being extremely minute; antennae long and slender, all the joints elongate, the third one and two-thirds the length of the fourth, the latter being about four times as long as its apical width. Thorax long and slender, formed much as in *C. rapax,* and with sparse, pale, erect hairs; the pronotum densely and finely punctured, somewhat shining in front of the transverse sulcature, the propodeum quite dull and very densely and evenly sculptured, with only a few fine transverse wrinkles just above the base of the abdomen. Front legs very similar throughout to those of *C. rapax* (but clothed with only a few short and inconspicuous hairs) the trochanters dilating from close to the base and without a long thin stalk and the chelae also similar. Abdomen with scattered erect hairs, in some aspects the surface having a slightly metallic lustre. Length 4 mm.

HAB. Nogales, Arizona; collected on weeds in September.

### 10. *Chalcogonatopus herbarum* sp. nov.

Yellowish-red to brownish or dark red, the abdominal petiole black, four to six of the basal joints of the antennae, usually ferruginous or yellowish, the fourth, fifth and sixth generally dark above, sometimes all but the basal two joints are dark, though in this case the third to the fifth are usually more or less reddish-tinged at least beneath. Middle and hind femora with a pale yellow or whitish band between the middle and the apex, which is black or dark, the apices of the tibiae also dark.

Head distinctly, but not strongly, concave above, dull, with excessively minute close sculpture. Antennae moderately long all the joints being elongate, the penultimate being at least one and a half times as long as its greatest width, the third joint one and two-thirds the length of the fourth. The pronotum is smooth and shining, but is punctate, the transverse division very distinct, the mesonotal constriction moderately elongate. There are a few short hairs on the thorax above, and the usual long ones just behind the mesothoracic constriction beneath. The propodeum is dull, with very fine sculpture on the disc near the spiracles, the whole posterior surface regularly transversely rugose, the wrinkles finer in some examples than in others, and in front of the spiracles and laterally the surface is also rugose. Legs formed as in *C. frequens* and others, at most with very short and inconspicuous hairs; first and fifth tarsal joints of front legs subequal, or with the latter slightly the longer, the lamellate denticles in a long row, the trochanters with short basal stalk. Abdomen shining, smooth, with hardly perceptible sculpture. Length 4-5 mm.

HAB. Nogales, Arizona; a series of specimens taken on weeds in August and September.

### 11. *Chalcogonatopus xestocephalus* sp. nov.

Extremely like *C. herbarum*, the chelae being similarly formed, the lamellate denticles reaching to, or almost to, the basal articulating cavity of the fifth joint beneath. The legs have a similar pattern, the thin apical part of the femora being conspicuously paler (whitish yellow) than the basal part, and with dark tips; the posterior tibiae also darkened at the apex. Trochanters of front legs dilating from close to the base, there being no long thin stalk.

Head, thorax, legs (except as noted above) and the base of the abdomen behind the petiole brown, in some parts darker in some more yellowish; mandibles except teeth, and the scape beneath pale yellow. Four basal antennal joints ferruginous or testaceous, the fourth more or less darkened, the following also obscurely pale, the apical joints black. Abdomen except near the base black. Head slightly concave, with the sculpture of the surface so feeble that it is shining, and bears also some sparse and excessively feeble punctures. Pronotum smooth and polished above, but at the sides, especially posteriorly, it is dull and densely sculptured. Propodeum with a faint impressed median line on the disc, where the surface is dull, or at least very little shining, posteriorly and at the sides it is very conspicuously transversely rugose; it is distinctly pilose, though the hairs are short and sparse. Abdomen smooth and shining, with very sparse pale hairs, most noticeable on the basal declivous portion, the punctures very remote and feeble, but some of them rather large; behind the petiole the abdomen is brown at the base, and the apical margins of its intermediate segments and the compressed apex, are more or less obscurely ferruginous. Length 4 mm.

HAB. Nogales, Arizona; one female on weeds in September.

### 12. *Chalcogonatopus unicus* sp. nov.

Ferruginous, the six apical joints of the antennae black, or nearly so, the one preceding these obscurely pale, the rest pale, the two basal joints being clearer than the third. Apices of middle and hind femora and of the tibiae blackish, basal joint of anterior tarsi dark brown. Petiole of abdomen black.

Head distinctly concave above, verv dull, the sculpture, which may be considered as either a very dense fine puncturation, or a close microscopic reticulation of the surface, very even throughout the vertex and front. Antennae longer than those of *C. solitarius,* the third joint being much more than twice as long as the second, the fourth rather more than three times as long as wide at the apex. Pronotum punctate in front, pubescent, more shining posteriorly, transverse furrow very feeble, obsolescent, so that in lateral aspect, the outline of the pronotum is not much interrupted thereby, the posterior lobe also being somewhat compressed into a subcarinate form; propodeum dull, pilose, densely and finely punctulate on the disc, posteriorly with a few very fine transverse wrinkles. Lamellate denticles of fifth tarsal joint of front legs reaching to the articulatory cavity, the trochanters dilating from close to the base, so that there is no distinct slender basal stalk. Abdomen with sparse pale hairs, the surface dull or hardly shining, its sculpture being quite distinct, though extremely fine, in addition to which sparse feeble punctures are easily seen. Length about 4 mm.

HAB. Nogales, Arizona; a single example taken on weeds in September.

### 13. *Chalcogonatopus simulator* sp. nov.

Ferruginous, abdominal petiole, four apical joints of the antennae, and the mandibular teeth black or dark.

Head dull, appearing very densely and minutely punctate, or shagreened; third joint of antennae nearly four times as long as the second, the fourth about four times as long as its greatest width. Pronotum not or hardly at all shining, but minutely and closely punctured, the posterior part very little raised, the transverse division being obsolete; propodeum very dull, sparsely but distinctly pilose, very densely punctate or granulated on the disc; posteriorly with distinct transverse wrinkles. Chelar claw extremely strongly curved, its lower edge strongly curved towards the base, first and fourth joints of front tarsi not differing much in length. Abdomen smooth and shining along the apical margins of the segments, duller and closely sculptured elsewhere on the intermediate segments, clothed with very sparse pale hairs. Length 5-5.5 mm.

This species is allied to the following, *C. koebelei,* with which in most respects it agrees in structure. It is easily distinguished by its smaller size, differently colored antennae and by the propodeum being more strongly rounded above, as seen in profile, rising up more strongly from the mesonotal constriction.

HAB. Nogales, Arizona; collected on weeds in September.

### 14. *Chalcogonatopus koebelei,* sp. nov.

Ferruginous, seventh and eighth joints of antennae, black or suffused with blackish, the sixth also generally more or less suffused; abdominal petiole black; teeth of mandibles dark red or brown. Thin portion of femora concolorous with the basal dilated part.

Head strongly concave above, dull or almost so, with very dense minute puncturation or granular appearance; third antennal joint four times the length of the second; penultimate joint elongate, about twice as long as wide. Pronotum simple, no trace of a transverse impressed line or furrow, densely sculptured like the head in front, but posteriorly smoother and more shining; mesonotal constriction and propodeum with similar dense sculpture and dull, the latter very long-ovate, the sides gradually narrowing in front to the width of the mesonotal constriction; the whole thorax sparsely but distinctly pilose. Front trochanters dilating from close to the base, so that there is no elongate basal stalk, first and fourth tarsal joints subequal; fifth with two long rows of lamellate denticles beneath, of which, as in various other species, one row extends further back than the other, its denticles nearly reaching the articular cavity, towards which they are set more widely apart from one another; the other row shorter. Chelar claw very strongly curved. Legs thinly pilose, the hairs on the posterior tibiae as long as these are thick. Abdomen shining and smoother along the apical margins of the intermediate segments, which elsewhere are densely minutely sculptured, and bear also some feeble largish punctures, from which the sparse hairs spring. Length 6 mm.

Hab. Nogales, Arizona; in August on oak.

### 15. *Chalcogonatopus perdebilis* sp. nov.

Testaceous, the abdominal petiole black, the antennae yellow or testaceous, but towards the apex they become more or less smoky, even strongly so in some specimens. Hind and middle femora distinctly variegate, paler on the thin apical part than on the basal, and the extreme tips darkened.

Head not very strongly transverse, deeply concave, and with the surface smooth and shining, the space between the eyes anteriorly much shorter than the length of the head along the median dorsal line. Antennae with the fourth joint longer than the second, and three or more times longer than its greatest width. Pronotum behind the transverse groove closely punctate or sculptured, and not shining, the mesonotal constriction dull, elongate; the propodeum more or less shining on the disc, posteriorly rugose, and with some short hairs. Front legs with the first and fourth joints of the tarsi not differing much in length, the fifth beneath with a short row of lamellate denticles occupying about half the length of the underside of the joint between the articular cavity and the terminal curved portion or hook, the denticle nearest the articular cavity much the longest, chelar claw slender, moderately curved. Abdomen shining and smooth. Length 2.5-3.2 mm.

This description is mainly drawn up from the type specimen. Of the several examples seen none seem quite identical in sculpture, form, etc., and it is possible that there is more than one species before me. One of these appears to have longer antennae and legs, the front trochanters with longer and thinner stalk and two minute projecting angles just behind the mesonotal constriction. The propodeum may be little, or not at all, shining.

The material is not sufficient for an understanding of the limits between variation and specific distinction.

HAB. Nogales, Arizona; collected from weeds in September.

### *Eucamptonyx* gen. nov.

General form as in Gonatopus; mandibles with four teeth, maxillary palpi 6-jointed, labial 3-jointed; pronotum with strong transverse constriction; front trochanters long, with basal thin stalk, chelar claw nearly straight and parallel-sided for most of its length, towards the apex suddenly and strongly bent, this bent part flattened, beneath armed with well-developed lamellate denticles, but without an anteapical tooth.

Not related to *Apterodryinus,* but rather to *Agonatopoides,* which has only 5-jointed maxillary palpi and the chelar claw normal for a parasite on Delphacids.

### *Eucamptonyx testaceus* sp. nov.

Testaceous or ferruginous, the head being darker than the abdomen and legs, the abdominal petiole black, the apical six joints of the antennae being infuscate or sordid on the left side, but much less so on the right in the unique specimen.

Head above very strongly transverse, twice as wide as long in the middle, the eyes extremely wide apart in front, the surface dull, very densely punctate, distinctly concave. Antennae slender, the third joint about one and a half times the length of the fourth, the latter four times as long as its apical width or rather more. Front lobe of pronotum shining, the posterior one subcarinate, densely sculptured like the head, the mesonotal constriction elongate, the propodeum very strongly rounded above, smooth or hardly sculptured on the disc, finely transversely rugose behind; front legs with the fourth tarsal joint subequal to the first, or not much shorter, fifth with the lamellate denticles not nearly reaching the articular concavity, the chelar claw with four or five lamellate denticles. Abdomen smooth, but scarcely shining, with hardly visible surface sculpture even under a very strong lens. Length nearly 4 mm.

HAB. Nogales, Arizona; a single specimen taken on weeds in August.

## *Agonatopus* gen. nov.

Distinguished from *Chalcogonatopus* by having only five joints to the maxillary palpi, two before and three beyond the geniculation.

### Table of species of *Agonatopus*.

1 (8) Pronotum with strong constriction, dividing it into two lobes, the posterior not compressed, cariniform.
2 (5) Lamellate denticles of fifth joint of front tarsi beneath not reaching back to the articular cavity.
3 (4) Abdomen ferruginous or testaceous. . *A. pallidicornis*.
4 (3) Abdomen mostly black.. *A. pallidicornis* var. *dubiosus*.
5 (2) Lamellate denticles of front tarsi almost reaching the articular cavity of the fifth joint beneath.
6 (7) Insect almost wholly ferruginous. . . . *A. ferrugineus*.
7 (6) Insect largely dark brown and black. . *A. picescens*.
8 (1) Pronotum compressed into a median carina on the posterior part, which is only faintly separated from the anterior .................... *A. heterothorax*.

*A. innitidus* was bred after the construction of this table, where it would be placed with *A. pallidicornis* var. *dubiosus*, from which the dull abdomen would at once separate it.

### 1. *Agonatopus pallidicornis* sp. nov.

Yellowish-brown or testaceous, the abdominal petiole black, tips of the front femora, the thin part of the hind and intermediate ones pale yellow, the tips of the two latter being slightly, but noticeably, darkened. Mandibles yellow, the teeth dark, reddish or brown. Antennae concolorous or almost so, sometimes subinfuscate apically, but never black. Head distinctly concave, long above, not at all strongly transverse, compared with many other forms, the inner margin of the eyes strongly convergent anteriorly, the surface shining, the sculpture being extremely feeble. Antennae with the third joint rather less than twice the length of the fourth, the latter about four times as long as its greatest width. Pronotum with strong transverse constriction; behind which it is very smooth and shining; mesonotal constriction dull, longish; propodeum elongate, almost evenly curved above in profile, the sculpture on the disc very fine, the surface in some examples being somewhat shining there, but not always; posteriorly, transversely rugose, the hairs very sparse, in some examples only one or two being visible, but these are no doubt more or less abraded. Anterior legs with the basal thin stalk of the trochanters not long, basal and fourth tarsal joint not differing much in length, the lamellate denticles on the fifth joint beneath not nearly reaching the articular cavity, the denticle nearest to this being twice the size of those at the other end of the row, but the setae, which are fine and long, extend back to the cavity. Abdomen nearly smooth, bearing a very few short hairs, and some excessively faint, obsolete punctures. Length 4-4.5 mm.

### *Agonatopus pallidicornis* var. *dubiosus.*

Like a small example of the above in structure, the third and apical joint of the antennae being somewhat darkened or infuscate, the abdomen shining black, pale only immediately behind the petiole, and on the compressed apical segment. Length 3 mm.

HAB. Nogales, Arizona; on weeds in September.

### 2. *Agonatopus ferrugineus* sp. nov.

In form and color like *A. pallidicornis*, but readily distinguished by the black apical joints of the antennae, of which the first two joints are always and the third usually, entirely pale, while one or two of the following may be concolorous with these. Front tarsi generally more or less dark or infuscate, the basal joint being usually largely or entirely pale. The head appears to vary in intensity of sculpture, but this is not strong enough to prevent the surface being somewhat shining, at least in most examples. Structurally this species may be at once separated from the preceding by the armature of the chelae, the fifth tarsal joint having its lamellate denticles reaching nearly to the articulatory cavity, the head is decidedly more transverse, and in fresh specimens the propodeum is probably more pilose, but easily abraded. The sculpture of the latter seems to vary similarly in each species. Length 4-5 mm.

HAB. Nogales, Arizona; on weeds and grass in August and September.

### 3. *Agonatopus picescens* sp. nov.

Like the preceding in structure, but differs greatly in color. Head dark brown, pronotum and mesonotal constriction paler than the head, propodeum black, red-tinged on the disc. Abdomen black, brownish just behind the petiole and on the compressed apical segment. Legs dark-brown or pitchy, but the tarsi for the most part and the trochanters, the front tibiae inwardly, the middle of the posterior and intermediate tibiae are paler, yellowish or testaceous. Mandibles, except the teeth, the thin part of the hind and middle femora, except the dark apices, pale yellow. Two basal joints of antennae yellowish brown, but the scape is darker above, the third also brownish, the rest black. Length 4 mm.

This will probably prove to be an extreme color variety of the preceding and there will be intermediate conditions in coloration. I can see no structural distinction.

HAB. Nogales, Arizona; on grass in August.

### 4. *Agonatopus innitidus* sp. nov.

Testaceous, the abdomen black, as also the antennae except the basal joint and the second, the latter partly infuscate; front tarsi to a large extent sordid; propodeum brownish, darker than the pronotum, tips of the front and middle femora white, the posterior ones widely white at apex, middle and hind tibiae black at base, and the latter also at the extreme apex.

A slender species, the head not strongly transverse, dull, with excessively fine close sculpture, hardly visible; antennae slender, the second joint elongate, as long as the fourth, the third much longer than these, the eighth about twice as long as wide. Whole thorax appearing densely punctate, from the nature of the surface sculpture, mesonotal constriction long and slender, the mesopleura well separated from the other elements of the thorax, the propodeum strongly and nearly evenly rounded above when viewed in profile, and clothed with sparse pubescence. Front legs with the trochanters long, and with long thin basal stalk, first and fourth tarsal joints subequal; lamellae of fifth joint extending throughout its length to the articulating cavity beneath, chelar claw slender and lightly curved. Abdomen dull, coriaceous, or microscopically shagreened, bearing sparse short pale hairs. Length 2.5 mm.

HAB. Nogales, Arizona: larva on a very small Jassid found on grass (the larval sac on abdomen, and very large), pupated on the first of October (Koebele under No. 2506): parasite emerged in Honolulu on March 3rd, 1907. The species is very distinct from anything else in the genus by its color combined with the sculpture of the abdomen. The maxillary palpi have the three terminal joints unusually short.

### 5. *Agonatopus heterothorax* sp. nov.

Black, the three basal joints of the antennae brown, the second paler, the scape whitish in front. Clypeus and mandibles (except the teeth) testaceous or yellowish, the former dark on the disc. Pronotum along the sides, and the front coxae beneath, brownish. The legs are largely dark colored, or nearly black, the anterior femora and the thin part of the middle and hind ones more brownish-pitchy, as also the hind tibiae in the middle, the tarsi of middle and hind legs mostly paler, sordid yellowish, the chelar claw yellow. Abdomen brownish-tinged near the base.

Head moderately strongly transverse, lightly concave above, dull with the appearance of very dense puncturation or shagreening, due to excessively dense reticulate surface rugulosity, as seen under high powers of the microscope. Mesonotal constriction and propodeum similarly sculptured and dull. Third antennal joint equal to the fourth and fifth together, the fourth about two and a half times the length of its greatest width. Pronotum ovate, well rounded in front and at the sides, the transverse impressed line hardly visible, in front of this line sculptured like the head, as also at the sides, but shining in the middle behind it, where it is compressed and cariniform. Head and thorax with short pale pubescence, the propodeum posteriorly with very little evidence of transverse wrinkles. Front trochanters short and stout, dilating at once from the base, the femora very robust, first and fourth tarsal joints subequal, the fifth beneath with very long row of close-set hyaline lamellate denticles, which reach to to articular cavity and convergent with these towards the free extremity of the joint is a second row of about 7 or 8 stronger and more hyaline denticles, which are set wide apart from one another. Chelar claw moderately curved, with the usual armature of Jassid parasites. Abdomen dull, with very minute reticulate rugulosity of the surface, pilose, and with very faint, sparse punctures. Length about 4 mm.

This species has no relationship with any of the preceding, and will, no doubt, subsequently be separated generically.

HAB. Nogales, Arizona; a single female was bred in Honolulu on January 17th, 1907 from a cocoon obtained from a large dark Jassid nymph found on grass, the larval sac being placed on the underside of the abdomen (2495).

### *Agonatopoides* gen. nov.

General form of *Gonatopus,* the labial palpi three-jointed, the maxillary palpi five-jointed, there being three joints beyond the geniculation, front legs with chelae armed for catching Fulgorids, the chelar claw having well-developed lamellate denticles, and a minute but distinct tooth near the apex.

### *Agonatopoides synchromus* sp. nov.

Ferruginous or testaceous, the abdominal petiole black, the antennae infuscate after the two basal joints, those towards the apex more yellow-tinged than the intermediate ones.

Head concave between the eyes, the surface nearly smooth and somewhat shining, the sculpture being very indistinct. Antennae slender, the third joint about twice as long as the fourth, which is more than three times as long as its greatest width at the apex. Pronotum with fine close puncturation or sculpture, which is not very definite; mesonotal constriction dull and narrow; the propodeum long-ovate, its upper edge in profile very slightly curved, till it is rounded off at the posterior declivous portion, in no wise rising at all abruptly from the mesonotum. The sculpture on the disc is very fine and in some examples evanescent, posteriorly there are very fine transverse wrinkles and few or no hairs are present. The abdomen is hardly visibly sculptured. Trochanters of front legs rather long and slender, there being a distinct, thin basal stalk, the first tarsal joint is as long or rather longer than the fourth, the fifth has two rows of convergent lamellate denticles, those nearest the articular cavity being the longest, and not far distant from the cavity; chelar claw with six or eight denticles. Length 4 mm.

HAB. Nogales, Arizona; collected on weeds and bred (2473) from a Delphacid, *Cochise apacheanus,* nymph and adult, found on grass.

### *Neogonatopus* Perk.

1 (2) Chelar claw with a tooth near the apex....*N.* ***mimus.***
2 (1) Chelar claw without such a tooth......*N.* ***mimoides.***

### 1. *Neogonatopus mimus* sp. nov.

Ferruginous or testaceous, abdominal petiole black, abdomen often darker than the thorax or brown, the first two and usually the third joint of the antennae altogether or for the most part, clear testaceous, the rest black or nearly so; mandibular teeth dark.

Head strongly transverse, distinctly impressed along the middle line; in front of the ocelli smooth and shining, but behind these dull and with dense minute sculpture; antennae shortish and stout, the fourth joint being only as long as the second and hardly twice as long as its greatest width at apex, the third joint rather more than one and a half times the length of the fourth. Pronotum shining, smooth or almost so, the lobes very distinctly divided, mesonotal constriction dull and rather short, propodeum very feebly sculptured on the disc and sometimes dull, but usually more or less shining, posteriorly transversely rugose, with short and very sparse erect hairs. Front legs with the chelar claw with a minute tooth close to the apex beneath, the trochanters dilating from close to the base; fourth tarsal joint shorter than the first, the fifth with the modified free extremity much less hooked than is usual in Jassid parasites, the lamellate denticles not reaching back to the articular cavity but towards this replaced by bristles. Abdomen nearly smooth, with scattered hairs. Length 2.5-3 mm.

This species, resembling in color so many others of allied genera from Arizona, is distinguished by the sculpture of the head, the short antennae and the chelae. The latter more nearly resemble those of a Fulgorid parasite than is the case in any species known to me of the Gonatopus s. l. group. However, even had it not been bred, it would have been placed, as certainly a Jassid parasite, by any one familiar with the various forms of the chelae.

HAB. Nogales, Arizona; collected on weeds and bred from Jassids (numbers 2448 and 2448-b.).

### 2. *Neogonatopus mimoides* sp. nov.

Ferruginous or testaceous, the petiole black, the mandibles pale yellow with dark teeth. Thin part of posterior and middle femora distinctly paler than the dilated basal part, the tips darkened. Antennae with the three basal joints pale, the rest black or nearly so. Except for the slightly variegated color of the legs almost like the preceding, but more slender and elongate and very distinct by many points of structure.

Head not very strongly transverse, the eyes much closer together in front than those of *N. mimus*, distinctly concave, and the surface smooth and shining, with at most a very indefinite sculpture. Antennae slender and longer than in *N. mimus,* the fourth joint longer than the second, and about three times as long as its greatest width, the third one and two-thirds the length of the fourth. Pronotum with well-marked transverse constriction, shining, very minutely punctate, or sculptured, and with sparse short hairs; mesonotal constriction longish, the sides forming an almost regular outline with those of the propodeum, the latter narrow, in no wise strongly or abruptly raised in front of the spiracles, closely and minutely punctured or shagreened on the disc, posteriorly transversely rugulose, sparsely pilose. Front trochanters dilating from close to the base, the first and fourth tarsal joints subequal, the fifth with long row of lamellate denticles beneath, chelar claw moderately curved, of the usual structure of Jassid parasites, there being no anteapical tooth. Abdomen smooth, shining, sparsely, but distinctly, pilose. Length 3 mm.

HAB. Nogales, Arizona; on weeds in September.

### *Gonatopus* Ljung.

The single species described differs from those I have examined from Europe and Australia in the simple, undivided pronotum.

### *Gonatopus haplothorax* sp. nov.

Testaceous or ferruginous, the abdominal petiole black, the abdominal segments with some pale yellow or whitish bands or maculae, rarely absent. Antennae with 3-5 basal joints pale, the apical ones being black. Legs not variegate.

Head rather strongly transverse, somewhat concave, being more deeply impressed in the middle, nearly smooth and shining in front of the ocelli, but posteriorly dull and minutely and densely punctured. Antennae longish, fourth joint much longer than the second, about four times as long as its apical width. Pronotum simply convex, not transversely divided, finely punctured and subpubescent in front, posteriorly smoother and shining. Propodeum long, ovate, narrowing gradually into the mesonotal constriction, in profile rising gently from this and not at all abrupt, densely minutely sculptured and with quite evident, but short, white pubescence. Front trochanters stout, thickened from the base: lamellate denticles in a long even row on the lower edge of the fifth joint of tarsi, and reaching to, or almost to, the articulating cavity, chelar claw moderately curved. Abdomen smooth, not or hardly sculptured, in fresh specimens with sparse pale hairs. Length about 3 mm.

One example has no evident pale markings on the abdomen, but probably this is chiefly due to post mortem changes of color. The above species will, I suspect, be subsequently and properly separated from *Gonatopus,* as a distinct genus, but as in some of the allied genera intermediate conditions between a simple and a transversely divided pronotum are found, for the present it may be associated with the Jassid parasites, that have a five-jointed maxillary and two-jointed labial palpus. Length 3.5 mm.

HAB. Nogales, Arizona; collected from weeds in August and September.

### *Pseudogonatopus* Perk.

1 (2) General color black ..............*P. autoxenobius.*
2 (1) Testaceous, the abdominal petiole black..*P. arizonicus.*

### 1. *Pseudogonatopus arizonicus* sp. nov.

Testaceous or ferruginous, abdomen sometimes brownish, the petiole black, the apical seven joints of the antennae darkly infuscate or blackish, mandibular teeth dark.

Head distinctly concave above, narrow between the eyes anteriorly, the distance between their margins anteriorly being much less than the length of the head dorsally along the middle line, the surface nearly smooth and more or less shining, but duller and more sculptured behind the line of the ocelli; antennae quite distinctly clavate, the fourth joint rather longer than the second and more than three times as long as its greatest width, the third being about one and two-thirds the length of the fourth. Pronotum distinctly transversely divided, on the posterior part closely and finely punctured, mesonotal constriction longish, behind which the thorax is strongly widened; propodeum strongly convex, rising quite abruptly from the mesonotum, as seen in profile, very densely and finely sculptured, dull or almost so, transversely rugulose posteriorly, without pilosity; front trochanters long and rather slender, first tarsal joint somewhat longer than the fourth, the fifth with the usual two rows of lamellate denticles, convergent towards the tip, the one row longer than the other, chelar claw with only about four denticles, and with a distinct tooth near the apex. Abdomen nearly smooth and very sparsely pilose. Length 2.5-3 mm.

HAB. Nogales, Arizona; bred from nymph and adult of the Delphacid (*Stobaera* sp?) numbers 2475 and 2452.

### 2. *Pseudogonatopus autoxenobius* sp. nov.

Black, face yellow or brownish yellow, occiput also brown, as also the pronotum, more or less, posteriorly; two basal joints of antennae pale, abdomen more or less brown in parts, at least apically and near the base; the femora are black or pitchy, the thin part of the middle and hind ones pale, tibiae brown, varying in depth of colour in different parts, tarsi paler, yellowish; the trochanters are pale, the front ones slightly embrowned, the front coxae light brown with a dark mark.

Head very strongly transverse, densely punctate or shagreened, strongly concave, the antennae slender, the fourth joint much longer than the second, about four times as long as its greatest width, the third more than one and a half times the length of the fourth. Pronotum strongly divided transversely, densely punctate or shagreened, considerably more strongly sculptured than the head, the mesonotal constriction elongate, behind which is a sutural transverse line; the propodeum dull, very densely sculptured all over, appearing punctate or shagreened, posteriorly also transversely wrinkled, and without hairs. Anterior trochanters with a longish basal stalk, which is, however, not very well marked, fourth tarsal joint long, but less so than the first, lamellate denticles of fifth in two long and dense rows, of which one reaches to the articular cavity, the chelar claw with four or five lamellate denticles and a distinct anteapical tooth. Abdomen smooth, without sculpture, but not very shining. Length with abdomen extended 4.5 mm.

HAB. Nogales, Arizona; bred from the same Delphacid, an adult, (*Stobaera* sp.) as the preceding; number 2463.

### *Neodryinus.*

I have retained this name for the present in my table of genera, though it may be synonymous with *Dryinus*, of which I have not a satisfactory description, nor any authentic European examples for comparison. It is certain that *Dryinus ormenidis* Ashm. comes very near to my *Neodryinus*, but in that species, if the thorax be viewed from in front, the position of the parapsides is distinguishable, though the furrows are almost effaced. In *Neodryinus* proper there is no trace of these furrows. The very remarkable habit of the larva of *Neodryinus* in covering its cocoon with the ruptured larval sac, which it removes from the leafhopper, is not found in any other genus of Dryinidae, nor does it occur in the case of *D. ormenidis*. To the Australian species of *Neodryinus,* I now add two new species from Arizona. One of these was bred, and its cocoon greatly resembles those of the Australian species, as also does the mature insect. *Dryinus alticola* and *D. maculicornis* of Cameron, from Central America, are, I suspect, closely allied to these Arizona species.

### 1. *Neodryinus arizonicus* sp. nov.

Black, the hind and middle tarsi, the fourth, fifth and more or less of the apical part of third joint of the antennae, clear testaceous or ferruginous; scape of antennae dark fuscous, yellowish beneath. Front femora inwardly with a rufescent line on the apical part and continued throughout the length of the tibiae. Front tarsi more or less brown, the chelar claw whitish. Wings pale at the extreme base, then with a wide transverse smoky band, reaching apically to the transverse median vein, a second oblique fascia or spot reaches about half across the wing, arising beneath the apical half of the stigma.

Head strongly transverse, hardly concave on the vertex, the ocelli in a triangle with the basal side widest, the surface dull, or almost so, and with a fine, close reticulation of wrinkles. Antennae with the third joint almost twice as long as the fourth, the latter about four times as long as its greatest width. Pronotum with a strongly raised posterior portion, in front of which the sculpture consists of very fine and close oblique striae on each side. Mesonotum more longitudinally rugose, but not regularly; propodeum with stronger longitudinal wrinkles, but more or less connected transversely so as to form reticulation. Lamellae of fifth tarsal joint elongate, closely set together, and reaching, or almost reaching, the articulatory cavity, the chelar claw curved, not armed with lamellate denticles, but with at most a few bristles, and a small angle or obscure tooth close to the apex. Abdomen smooth, shining, impunctate. Length 4—5 mm.

HAB. Nogales, Arizona; bred (no. 2450) from nymphs of *Ormenis septentrionalis* on Oak.

### 2. *Neodryinus dubiosus* sp. nov.

This may be a variety of the preceding, and possibly will be found to be parasitic on another species of Fulgorid. It differs from *N. arizonicus* in having the first, third, fourth and fifth joints of the antennae ferruginous, the sixth is also partly reddish, the small second joint being dark brown. The front femora are more extensively reddish brown, the tibiae almost entirely so, the middle femora are reddish at the tips, the posterior ones more widely so, the base of the hind tibiae being of the same colour. The reticulate rugosity of the head is stronger and the surface appears to be rather more shining.

HAB. Nogales, Arizona; a single female was captured on an oak tree in August.

### *Paradryinus* Perk.

The species here described agrees, on the whole, with the Australian species in its generic characters.

### *Paradryinus mexicanus* sp. nov.

Ferruginous, the head of a rather redder colour than the abdomen, legs, &c.; mesonotum, propodeum and mesopleura black, as also the abdomen on its apical half or more and the petiole; middle and hind tibiae, and the hind femora inwardly, brownish; apex of abdomen ferruginous.

Head convex on the vertex, seen from in front the hind margin almost straightly transverse, dull, with very dense punctuation or shagreening; antennae with very slender third joint, which is about one and a three-quarters the length of the fourth; the latter about seven times as long as wide, the following being somewhat wider than this. Pronotum rather strongly rounded laterally, compressed at the sides posteriorly, transversely constricted at the apex, raised on its hinder portion, but not strongly; the surface is dull, the sculpture excessively fine, hardly visible under a strong lens, and much finer than that of the head. Mesonotum dull, except the polished neck, which may be concealed beneath the pronotum, the surface very minutely shagreened, the parapsidal furrows fine, slightly convergent posteriorly almost reaching the hind margin; propodeum very densely reticulately rugose. Wings with an infuscation in the basal cells, extending a little beyond the transverse median vein apically, and a second one originating beneath the stigma and in the radial cell and forming a transverse fascia. First joint of front tarsi very long about twice as long as the elongated fourth, second very small, third larger than this but still small, the fourth being much longer than the preceding two together. Abdomen smooth and without definite sculpture. Length 4 mm.

HAB. Mexico (? Pazcuaro).

### *Hesperodryinus* gen. nov.

This new genus is proposed for three slender and elongate species, evidently allied to *Paradryinus.* All are of a ferruginous or testaceous colour, with short, but functional, wings, which are banded. The head is of peculiar form, being acutely wedge-shaped posteriorly, the hind margin when the head lies back, resting over a considerable part of the pronotum and entirely concealing the prolongation of the prothorax in front of the pronotum. Consequently, when seen from in front, the hind margin of the head is well rounded and extended far back behind the eyes, the posterior ocelli being placed well behind an imaginary line joining the hind margins of the eyes. In *Paradryinus,* when the head is viewed from in front, the hind margin is nearly straightly transverse and the posterior ocelli generally about on a line with the hind margin of the eyes. The pronotum is strongly compressed at the sides posteriorly, so that it is there bluntly cariniform, its sculpture and that of the head is very dense and minute, the surface being quite dull. Otherwise the genus greatly resembles *Paradryinus,* the maxillary palpi with four long joints beyond the geniculation, the two basal ones, as usual, less distinctly divided, the basal apparently less chitinized and perhaps more or less fused to the maxilla. Labial palpi three-jointed, the apical one very long and cylindrical. The front legs are formed much as in *Paradryinus,* but are rather stouter; the second joint of the tarsus is very small, the third much longer, but still much shorter than the fourth; the chelar claw of one species differs remarkably in structure from that of the others; the lamellate denticles of the fourth joint are well developed and reach or nearly reach back to the articular cavity.

The males of two species are known, and these may be easily distinguished from those of *Paradryinus* by the eyes having comparatively few and short hairs, hardly noticeable under a strong lens, and by the much less conspicuously hairy antennae. In both species the femora and tibiae are black, while in all the known males of *Paradryinus* the legs are ferruginous or testaceous. Type of genus *H. arizonicus.*

Table of species of *Hesperodryinus.*

1 (2) Chelar claw in lateral view nearly parallel sided, hardly curved except at the tip, near which is a distinct prominent tooth .............. *H. amphiscepae.*
2 (1) Chelar claw well curved, and without a tooth near the apex.
3 (4) Propodeum rather finely reticulately rugose about the middle dorsally, on each side of this with minute shagreening or surface sculpture...*H. arizonicus.*
4 (3) Propodeum with strong longitudinal wrinkles all over its upper surface .................. *H. audax.*

### 1. *Hesperodryinus amphiscepae* sp. nov.

Ferruginous, abdominal petiole black, the apical segments often more or less infuscate. Three basal joints of antennae concolorous with the head, the fourth and fifth white or whitish with a dark line, or the usually dark part may be concolorous with the preceding joints, following joints dark or sordid, the apical one usually paler.

Head dull, excessively finely and closely sculptured; second joint of antennae about half as long as the fourth, the third twice as long as the latter, dull and microscopically sculptured like the head, without any transverse division, but strongly compressed at the sides so as to be bluntly cariniform on its posterior half or two-thirds. Mesonotum more or less finely and sometimes vaguely longitudinally rugose, the surface minutely granulate or coriaceous, the parapsidal furrows easily seen when the thorax is viewed from in front; scutellum minutely punctate or shagreened; propodeum reticulately rugose, but at the sides with dense minute surface sculpture only, about as long as the mesonotum and the two scutella together. Front trochanters short and stout, lamellae of fifth tarsal joint in a long line extending to, or nearly to, the articulating cavity; this line of denticles appears to consist of two rows or more, which are more or less confused; chelar claw with the denticles more spinose, and set further apart, the anteapical tooth distinct. Abdomen smooth, without any definite sculpture. Neuration mostly pale, yellowish, the transverse nervures being more or less dark, and with a dark transverse cloud along them, a second transverse cloud extends across the wing from about the middle of the stigma, but fades out before the tip, stigma yellowish or fuscous, white on the basal part. Length 4-6 mm.

Male black, the front tibiae rufescent, the extreme tips of all the femora also pale, basal joint of middle and hind tarsi and the second more or less, white. Head, mesonotum, and scutellum all similarly sculptured, and pubescent, the sculpture appearing as a dense rugosity or rugose puncturation; scape of antennae about as long as the fourth joint, the second ovate, the third rather more than one and a half times the length of the fourth, and fully three times as long as wide. Towards the apex of the antennae the joints become gradually more slender. Parapsidal furrows indistinct, but, if examined from the front, they can be traced as converging lines to the hind-margin of the mesonotum, where they are still widely separated; propodeum strongly rugose. Wings with the stigma blackish fuscous, the radius angulated before the middle and reaching only about half way from its base to the tip of the wing. Abdomen ovate, very finely punctured, and clothed with short hairs, basal segment angularly bent about the middle, its basal face impressed. Length 3 mm.

HAB. Nogales, Arizona; collected on grass and bred from nymphs of *Amphiscepa bivittata.* The larval sac is placed beneath the tegmen or wing; number 2446.

### 2. *Hesperodryinus arizonicus* sp. nov.

Colour, form, size and for the most part the sculpture, as in the preceding species, fourth and fifth antennal joints entirely white or with a dark line, the antennae no doubt varying in colour, as they do in *H. amphiscepae;* propodeum with loose reticulate rugosity about the middle of the dorsum. Chelae quite unlike those of *H. amphiscepae,* the fifth joint with a curved edge beneath, bearing the lamellate denticles, the chelar claw well and almost evenly curved, its lower edge on the basal half somewhat serrate and with a few spinose bristles and with no trace of a tooth near the apex.

HAB. Nogales, Arizona; bred from the nymphs of *Mistharnophantia sonorana;* the larval sac is black and placed beneath the wing or tegmen. I cannot certainly decide whether the males under the number 2481. belong to this species wholly or in part, or to the preceding. They do not agree altogether in details amongst themselves and the possibility of either species of the parasite attacking both of the hosts is so great, that the male I have assigned to *H. amphiscepae* may really belong to *H. arizonicus.*

### 3. *Hesperodryinus audax* sp. nov.

Colour, form, and sculpture generally, almost as in the preceding two species. This is, however, of larger size, the third antennal joint is black, pale only at the tip; the mesonotum is regularly and closely longitudinally rugose, the propodeum is also strongly longitudinally wrinkled, with very little reticulation, at least on the dorsal surface. Chelae formed and armed almost as in *H. arizonicus;* just beyond the most apical of the spinose bristles there is a slight elevation of the lower edge of the chelar claw, hardly to be considered as a tooth. Length 8 mm.

HAB. Nogales, Arizona; one example was captured on an oak tree.

### *Perodryinus* gen. nov.

General form and structure of *Paradryinus,* but with the front tarsi very different. The basal joint is long and slender, as long as the four following together, the second small, the third and fourth subequal, the backward process of the fifth reaching to the base of the fourth, and densely armed with lamellate denticles; the chelar claw a simple spine with dilated base for articulation, the chelae being extremely short. Pronotum longer than the mesonotum, compressed posteriorly, but without a transverse division; mesonotum without parapsidal furrows, with dense rugose-punctate or reticulate sculpture.

Male like that of *Paradryinus* but the eyes are bare, there are no parapsidal furrows, the radius is short, falls far short of the wing margin, and is bent at about its middle.

### *Perodryinus amoenus* sp. nov.

Black, antennae, the clypeus, the pronotum and the legs ferruginous, the antennae subinfuscate apically. The mandibles except the teeth, the basal half of the posterior tibiae, the basal joint more or less of the middle and hind tarsi, whitish; tips of hind femora black.

Head and mesonotum very densely rugose-punctate or reticulate; third antennal joint long, twice as long as the fourth. Pronotum rugulose and with pale pubescence; scutellum rather smoother than the mesonotum, the propodeum shining, reticulate-

[illegible] poste- [illegible] the middle [illegible] and the [illegible] middle of the [illegible] having [illegible]

[illegible] the [illegible] and a [illegible] previous [illegible] like [illegible] [illegible] and [illegible]

[illegible] The [illegible] and [illegible]

[illegible]

[illegible] already [illegible] further [illegible] agree [illegible] follow- [illegible] of the [illegible]

[illegible]

[illegible] similar for the [illegible] transverse [illegible]

Black, the trochanters, the front tibiae and all the tarsi pale, yellowish brown to testaceous. Two basal joints of antennae clear yellowish (the apical joint is wanting in the example described). Mandibles yellowish, the teeth dark, the inner one considerably smaller than the two well-developed outer ones. Legs except as above described, pitchy to black, the middle and front femora being lighter than the hind ones.

Head and thorax very densely and evenly shagreened, dull, the scutellum more shining, the propodeum distinctly areolated, and the surface rugose. Abdomen ovate, very smooth and polished.

The sculpture of this species is almost as in *E. mirabilis*, the dense surface sculpture of head and mesonotum giving them the appearance of being closely and evenly punctured. The raised lines on the propodeum are stronger in *E. arizonica*, and the areolation therefore more definite. The postscutellum is as feebly developed in the winged as in the subapterous species. Length 3 mm.

HAB. Nogales, Arizona: one female collected on weeds in September. Many parasitized *Bruchomorpha* were found on grass in this locality, at the same time, but from the cocoons obtained (no. 2483) no adults have as yet emerged.

### *Deinodryinus* gen. nov.

Head and thorax of large size, much more robust than the abdomen: head greatly produced behind the eyes, the sides there being convergent, the vertex strongly and straightly margined; ocelli in an equilateral triangle or almost so, and placed far in front of the posterior margin, distant from it by more than the length of the triangle that they form; vertex slightly convex or at least not at all impressed; mandibles with four strong teeth; maxillary palpi six-jointed, labial three-jointed, third antennal joint at least one and a half times the length of the fourth. Pronotum elongate, hardly rounded at sides, transversely impressed in front, its lateral posterior angles attaining the tegulae; mesonotum and scutellum together about as long as the pronotum, the former with deep, subconvergent parapsidal furrows, which fail before reaching the hind margin; propodeum moderately long, not at all areolated. Front legs with extremely stout femora, the first tarsal joint rather short, much shorter than the fourth, the second minute, transverse, the third much longer than this and not very much shorter than the first, the fifth very long and slender. Chelae well developed, freely extensible, row of lamellate denticles of fifth tarsal joint long, the chelar claw simply curved, with oblique grooves on each side of its lower edge, and without any subapical tooth, the whole being evidently adapted for catching Jassids. Stigma of front wings long, narrowly ovate, radius bent or angulate near the middle, where the (almost obliterated) transverse cubitus would originate. In the two species known the wings are bifasciate.

The male in this genus is very different superficially, being much smaller, black, with clear wings, but in many respects resembles the female. The head is more transverse, less produced behind the eyes, but otherwise rather similar, the ocelli being remote from the hind margin. The pronotum is as usual not or hardly visible in dorsal aspect and there are the other usual sexual differences. The most important characters appear to be the bare eyes, and the clothing of the antennae, these bearing long curved hairs, several times as long as the width of the elongate joints, the hairs tending to form whorls. The scape is clothed like the following joints, but the hairs on the apical ones become shorter, and the tenth joint has quite short ones. The posterior ocelli are distant, each from the nearest eye-margin by a space greater than that which lies between them. The mesonotal parapsides are like those of the female.

This is a remarkable genus and appears to me to be intermediate in character between the sections of Dryinidae with large ovate stigma and those with a narrow elongate one. It is, however, to be associated with the former section and comes near to *Chelogynus.*

### Table of Species.

1 (2) Head in front densely and more or less rugulosely punctured . . . . . . . . . . . . . . . . . . . . . . . . . . *D. paradoxus*
2 (1) Head in front for the most part with fine sparse punctures . . . . . . . . . . . . . . . . . . . . . . . . . . . *D. quercicola*

### 1. *Deinodryinus paradoxus* sp. nov.

Ferruginous, extreme base of abdomen black, apical two or three joints of the antennae black or blackish, and one or two of the preceding joints sometimes subinfuscate.

Head with feebly impressed, coarse, rugose punctures on the vertex, between the antennae and the front ocellus the sculpture is finer and dense, more or less rugulosely punctate. Third joint of antennae one and a half times the length of the fourth or rather more, the latter three or more times as long as wide, fifth wider than the fourth, but of nearly equal length. Pronotum irregularly punctured, the punctures of unequal size; mesonotum smooth and shining, very sparsely punctured, the suture between it and the almost or quite impunctate scutellum, deep and consute; propodeum finely transversely rugose, pilose, and subimpressed medially on its posterior portion. Legs shortly, but distinctly, pilose; the tarsi pallid; wings distinctly, but not deeply bifasciate, the stigma yellow. Abdomen smooth and polished, impunctate or almost so. Length about 5 mm.

Male black, the antennae, clypeus for the most part, mandibles except the teeth, antennae, front and middle tibiae testaceous or ferruginous, apical joint of antennae more or less black, the tarsi pale, whitish. Head coarsely rugose-punctate, pilose like the thorax; the antennae with all the joints elongate and for the most part not differing much in length, the apical joint acuminate and one and a half times the length of the preceding, the third four times as long as broad. Mesonotum and scutellum shining, sparsely punctured, propodeum short, irregularly rugose, or with close rèticulation. Wings hyaline, stigma blackish. Abdomen small and narrow, subclavate. Length about 4 mm.

HAB. Nogales, Arizona; collected on oak and cocoons obtained in August and September; the female bred in October (2466). I bred male and female (under the same number) in Honolulu at the end of February from cocoons obtained in September at Nogales. It is parasitic on a large green Jassid on Oak.

### 2. *Deinodryinus quercicola* sp. nov.

Form, size and colour like that of the preceding species, from which it is easily distinguished by the colour of the antennae, the fourth to the tenth joints being dark, black or blackish, though the more basal of these are yellow- tinged, the third joint is also more or less infuscate. The extreme apex of the middle tibiae, the extreme base and apex of the hind ones, and the extreme base of the hind tarsi, are dark.

The general sculpture is for the most part like that of *D. paradoxus,* but that of the head is quite different, since its surface is smooth with only very fine and scattered punctures, and in nowise rugose. Only for a very short space, immediately above the antennae, is the sculpture dense and somewhat as in the preceding species.

HAB. Nogales, Arizona; a single example was captured beneath an oak tree in September.

## *Chelogynus* Hal.

*Neochelogynus* of Bull. I is synonymous with this, as a comparison of European species shows, and the characters of the mouth parts are as described by me under that name. It is at once separable from *Anteon* by the partially extensile chelae and the different position of the articulation of the fourth and fifth tarsal joints, to which this mobility is due. *Chelogynus* at present includes insects with great differences in structure and will unquestionably be itself broken up.

### Table of Species described.

1 (2) Apical joint only of the antennae dark.........*C. lusus.*
2 (1) More than one antennal joint dark.
3 (4) Coxae mostly dark, pronotum with some transverse rugulosity . . . .........................*C. funestus.*
4 (3) Coxae altogether pale . ..............*C. melanacrias*

### 1. *Chelogynus funestus* sp. nov.

Black, the basal joints (usually about four) of the antennae ferruginous, the apical ones black. Some of the basal joints may be more or less darkened, the number of those that are red is not constant and the red often gradually merge into the dark apical ones. The front femora are sometimes pale, but may be nearly black, the middle and hind ones are generally black or at least pitchy-brown, and their tibiae are also dark, but noticeably pale on the basal part to a greater or less extent; hind coxae always black or dark, except that the extreme apex may be pale. Mandibles yellow, the teeth dark; neuration yellow, stigma dark fuscous.

Head and face quite dull, very densely and minutely shagreened or rugulose, the antennae with the flagellum subclavate, the scape about as long as the three following joints together, second joint subequal to third, which is slightly longer than the fourth, the fifth decidedly wider than the preceding, but none of the flagellar joints are transverse. Pronotum with some extremely fine transverse rugulosity; the mesonotum more or less shining, at least never dull like the head, and with at most a few very shallow punctures; scutellum shining and smooth, propodeum truncate, rugose, the truncation bounded by a raised line, posteriorly densely minutely shagreened and without any definite area. Fifth tarsal joint with well-developed lamellate denticles in two rows and with series of long setae at the side, chelar claw with long seta on the subbasal angle beneath. Abdomen smooth and shining. Length 2-5 mm.

Male black, anterior tibiae and tarsi testaceous, the middle and hind tarsi also more or less pale or brown, otherwise the legs nearly wholly black. Neuration brown, stigma dark brown or blackish fuscous. Head sculptured as in the female, and with faint traces of feeble punctures; antennae as long as the head and thorax, the scape fully as long as the two next joints, which do not differ much in length, the flagellum being submoniliform, with the joints nearly similar, clothed with hairs not shorter than their width; none of the joints are as wide as long. Mesonotum more shining than the head, with very feeble surface sculpture and traces of hardly visible punctures, scutellum polished; propodeum as in the female. Abdomen smooth and polished. Length 2 mm.

HAB. Tucson, Arizona; bred from nymphs of a Jassid found on a small bush (no. 2420) and probably the same species, with the legs paler generally, the posterior femora brown with black apices, was bred (no. 2461) and captured at Nogales. Mr. Koebele's note states that the host and probably the parasite from Nogales are the same as his Tucson specimens. The variation is considerable, and the description of the male and female is primarily based on two specimens bred from one individual of the hopper.

### 2. *Chelogynus melanacrias* sp. nov.

Black, mandibles (except the teeth) whitish, antennae clear testaceous on the basal joints, the four apical ones being black (at least above) one or two of those preceding these generally subinfuscate. Legs concolorous with the basal antennal joints, even the coxae entirely pale, the tips of the tarsi and the apices of the hind femora black or dark fuscous, the apical part of the hind tibiae sometimes infuscate.

Head dull, densely and minutely shagreened, the antennae with the second, third and fourth joints differing very little in length, the third being a little longer than the fourth, the fifth and following wider than the latter, the seventh rather longer than its greatest width. Pronotum somewhat transversely rugulose anteriorly, the mesonotum less densely sculptured and less dull than the head, and with only very feeble sparse punctures; scutellum polished; propodeum rugose before the truncation, posteriorly dull, with very dense and fine close rugulosity and generally some fine transverse wrinkles, but without any defined area. Lamellate denticles of chelae much as in the preceding. Stigma blackish fuscous, otherwise the neuration pale, except the radius. Abdomen smooth and shining. Length 2-2.5 mm.

HAB. Nogales, Arizona; captured on weeds in September.

### 3. *Chelogynus lusus* sp. nov.

Black, the mandibles (except the teeth) whitish, the antennae except the apical joint concolorous and testaceous, legs concolorous with these, but the hind femora are to a large extent black or blackish (the base being paler) and the apical part of the hind tibiae is also dark.

Head dull, densely minutely shagreened and with sparse traces of obsolete punctures. Antennae formed much as in the preceding, the apical joint alone dark. Pronotum very densely sculptured like the head, and dull, and I cannot detect any trace of the transverse rugulosity observable in the two preceding species. Mesonotum dull with very fine surface sculpture, and a few nearly effaced punctures; scutellum polished; propodeum as in the preceding. Stigma blackish fuscous, radius also dark, otherwise the nervures are pallid. Chelae much as in the preceding. Abdomen smooth and shining. Length 2 mm.

HAB. Tucson, Arizona; bred from the same species of hopper and at the same time as *C. funestus,* of which it might be a sport, but the colour characters are very different and the sculpture also differs (no. 2420).

### *Anteon* Jur.

The single species, which I refer to this genus, is congeneric with examples I have examined from Germany, having a similar structure of the chelae, and my *Prosanteon* from Australia is synonymous with it. In the European, Australian and American species the mouth-parts are as given by me in my characterization of *Prosanteon* in Bulletin I of this Station, and not as given by Ashmead in his Monograph of the Proctotrupidae and later writings. I consider the genus quite distinct from *Chelogynus* on account of the non-extensile chelae, the fourth tarsal joint being short and articulated to the fifth much further from the apex of the latter.

### *Anteon arizonensis* sp. nov.

Black, the mandibles (except the teeth) yellow, the antennae, except the subinfuscate apical joint, and the legs, testaceous; the middle coxae have a basal dark spot, the hind ones are black except at the apex, the middle femora have a dark line beneath and the posterior ones are dark brown or pitchy except at the extreme base and apex; stigma blackish fuscous, the radius also dark, the rest of nervures pale yellow.

Head shining, closely subrugosely punctured, but sparsely punctate about the ocelli, the antennae with the second and fourth joints subequal, the third considerably longer than the latter, the seventh, eighth and ninth wider than this, and short, being not much longer than wide. Pronotum finely rugulose; the mesonotum polished, with a few punctures in front, the furrows very short; scutellum impunctate; propodeum rugose and bounded posteriorly by a raised line, posteriorly dull and shagreened towards the sides, the median area, defined by very fine raised lines, smoother and somewhat shining. Abdomen smooth and polished. Fifth tarsal joint with fine bristles beneath, those near the articulatory cavity longest, the other extremity of the joint having short spinose ones. Length 2.5 mm.

The male of this species is smaller, under 2 mm. long, black, with whitish mandibles, the front and middle tibiae and tarsi testaceous, the rest of the legs to a large extent blackish or sordid, the knee-joints of the hind legs noticeably pale. The antennae have the basal four joints black, after which they shade into testaceous, the apical joints being clear or almost so.

Head somewhat shining, with somewhat coarse and indefinite puncturation, vaguely channeled in front of the anterior ocellus; scape of antennae about equal to the two following joints together, the second ovate, but longer than wide, about as long as those following, which do not differ much in length, the whole being somewhat moniliform-filiform, the hairs somewhat curved and in general about as long as the width of the joints. Mesonotum shining, with punctures like those of the head, but much more sparse, scutellum and postscutellum polished and impunctate, propodeum closely rugose, posteriorly smoother hardly more than shagreened even at the sides, the median area being defined by very fine lines, but quite observable on careful inspection. Abdomen smooth and polished.

HAB. Nogales, Arizona; bred from a medium sized, rather scarce Jassid nymph, on willow (no. 2467). Mr. Koebele remarks that the parasite is hard to raise.

### *Aphelopus* Dalm.

In a male specimen of this genus dissected by me the maxillary palpi are very long and five-jointed, the first four joints subequally elongate, the second much stouter than the third, the fifth nearly one and a half times the length of the preceding. I cannot detect any division of the long first-joint, such as forms the basal one in *Anteon* and other genera, and the labial palpi are only two-jointed, with the second one elongate-oval and much more developed than the first.

The larval sac of *Aphelopus* is easily distinguished from those of the other Dryinids by its elongate form, which resembles that of Emboleminae, and probably the genus would be better referred to that subfamily, which forms similar sacs on Orthoptera and has simple tarsi, if it be considered distinct from the Dryininae. A yellow Belytid also was bred from similar elongate sacs on Typhlocybines, sent over to me from Germany by Koebele. It is very curious that these small Typhlocybines can be as readily seized and parasitized by the non-chelate *Aphelopus* as by the rather imperfectly chelate *Chelogynus* or the perfectly chelate and highly evoluted *Pachygonatopus*. Many Typhlocybine Jassids were found parasitized by *Aphelopus* in Germany by Koebele, but either the larvae died on the way to Honolulu or the climate of the islands proved fatal, for the cocoons yielded no mature insects. The latter are difficult to sex; in some examples, which are certainly males, the abdomen in dry specimens is so compressed as to be laminate; but this is, I believe, due to post mortem collapse of the abdomen. In others the females are similarly compressed. In one species, of which males and females were both bred, the face of the former is largely white, in the latter black, and in other two species, which from the antennae I judge to be males, the face is conspicuously ornamented with white. Ashmead, however, describes a species in which the white preponderates in the female sex, so that the sexes cannot be determined off-hand by the facial coloration.

### Synopsis of species of *Aphelopus*.

1 (2) Head with the mandibles alone white. ..........
. . . ..........................*A. arizonicus* (female)

2 (1) Head with white facial markings.
3 (4) Clypeus alone white ................*A. microleucus.*
4 (3) More than the clypeus white.
5 (6) White facial markings extending a little above the antennae . . . . . . . . . . . . . . . . . . . . . . . . . . . . .*A. viduus.*
6 (5) White facial markings extending at least as far as the anterior ocellus, along the eye-margins.
7 (8) Mesonotum entirely black .......*A. arizonicus* (male)
8 (7) Mesonotum white externally to the parapsidal furrows . . . . . . . . . . . . . . . . . . . . . . . . . . *A. pulcherrimus*

## 1. *Aphelopus arizonicus* sp. nov.

Black, the mandibles except the teeth pale yellow, the basal two joints of the antennae yellow or yellowish brown; front and middle legs except the apices of the tarsi, the hind coxae, trochanters, and basal joint of tarsus, testaceous; the hind femora and tibiae black or pitchy; stigma blackish fuscous, the radius curved.

Head and mesonotum dull, densely minutely shagreened, the parapsidal furrows of the latter distinct, strongly convergent posteriorly, visible behind the middle of the mesonotum, but not reaching the posterior margin. Antennae subclavate, the 3rd, 4th and 5th joints slender, elongate and subequal, the seventh, eighth and ninth much wider than these, but none of them as wide as long, apical joint one and a half times the length of the preceding; scutellum decidedly more shining than the mesonotum; propodeum finely reticulately rugose, posteriorly with a large smoother and shining area defined by raised lines. Abdomen smooth and shining. Length 2 mm.

Male like the female in sculpture, but the two basal joints of the antennae are darker brown, the face below is yellow, with the yellow colour continued upwards along the inner orbits to the height of the anterior ocellus, the legs, except the tips of the tarsi, are entirely clear testaceous; the stigma is pallid brown, with darker margin. Antennae more elongate and less noticeably subclavate, the eighth and ninth joints short, hardly twice as long as wide, and shorter than the fourth 'and fifth. Propodeum not shining posteriorly.

HAB. Nogales, Arizona; bred from a species of *Dikraneura?* (no. 2454).

### 2. *Aphelopus viduus* sp. nov.

Male, black, the lower part of the face and the mandibles, except the teeth, pale yellow or cream-coloured, this colouring reaching about half way from the mandibles to the anterior ocellus and not being noticeably carried upwards along the inner orbits. Front and middle legs pale yellow, the tarsi for the most part infuscate, the hind femora tibiae and tarsi pitchy.

Head and mesonotum dull, densely shagreened and the latter with the parapsidal furrows distinct and like those of *A. arizonicus*. Antennae long, slender and filiform, the first two joints dark brown or pitchy, but with the extreme base of the scape yellow, third joint rather shorter than the fourth, which is shorter than the fifth, seventh and eighth almost equal, slender, longer than the fourth or fifth and more than twice as long as wide, tenth joint very slender and elongate. Scutellum, at least posteriorly, and the postscutellum smoother than the mesonotum, the propodeum reticulately rugose, a posterior area being defined by raised lines and smoother. Abdomen smooth and shining, stigma dark brown. Length about 2 mm.

HAB. Nogales, Arizona; collected on weeds in September.

### 3. *Aphelopus pulcherrimus* sp. nov.

Black, the whole face creamy white, this colour reaching almost to the anterior ocellus and at the sides is continued upwards as far as the posterior ocelli along the orbits, the outer orbits being also of the same colour; scape of antennae and all the legs whitish or pale yellow; also the whole of the mesonotum is cream-coloured exteriorly to the parapsidal furrows, and likewise the whole thorax beneath and the pleural portion. Antennae, except the scape, testaceous; wings with brown stigma.

Head and thorax sculptured as in the two preceding species, posterior area of metanotum dull, minutely shagreened. Antennae with the second and third joints shortish, not differing much in length, but the fourth is rather longer than the third, and subequal to the fifth. Abdomen smooth and shining. Length 1.5 mm.

Owing to their delicate nature the antennal joints have more or less collapsed and I cannot exactly make out the true shape of some of them, nor am I certain of the sex of the single example.

HAB. Nogales, Arizona; bred from a species of *Typhlocyba* (*Zygina*) no. 2455.

### 4. *Aphelopus microleucus* sp. nov.

Male, black, the clypeus and mandibles (except the red teeth) white, the two basal joints of the antennae dark brown or pitchy, all the coxae and trochanters pale yellowish-white or white, the front legs testaceous, but the femora are somewhat sordid and the tarsi except the basal joint infuscate; middle legs (except as above noted) still more darkly sordid and the hind legs almost black; stigma blackish fuscous.

Sculpture of head and mesonotum as in all the preceding, but the parapsidal furrows are effaced: propodeum reticulately rugose, this sculpture extending on to its posterior face also, where, however, there is a small smoother area. Antennae simple, filiform, first three joints subequal, shortish, not much longer than wide, the third on its wide face subtriangular, fourth and following nearly parallel-sided, the fifth, sixth, seventh subequal and longer and more slender than the fourth: seventh and eighth twice as long as wide, or more. Abdomen smooth and shining. Length under 2 mm.

HAB. Nogales, Arizona; bred from a species of *Typhlocyba* (*Zygina*) no. 2456.

## *ENCYRTIDAE.*

A remarkable Encyrtid was bred from larvae feeding internally in the body of a Jassid (*Oncometopia lateralis*) several parasites emerging from the host, which after their emergence lived for a week.

Following Ashmead's classification this species belongs to the tribe Encyrtini and I have felt some doubts whether it might not be referred to Mayr's genus *Prionomastix*, but the frons is so very wide that I have been obliged to consider it as a new one, and it is quite possible that in reality it is not at all allied to the other, which is unknown to me.

### *Thysanomastix* gen. nov.

Head strongly concave behind, the ocelli in a triangle with very wide base, but though so widely separated, the posterior ones are as far removed from the eye-margins as from one another, the frons being very broad. Head in front view widely subtriangular, strongly convex, the antennae inserted high up near the middle, the space between the eye and base of mandible about as long as the eye, the labrum exposed, the clypeus not defined, there being only an impression or fovea on each side just above the labrum. Mandibles truncate, one of the apical angles being more acute than the other, which is followed by minute microscopic indentation, but there are no true teeth, and the edge under high powers of the microscope is very finely serrulate. Antennae elongate, the scape long, clavate, extending above the vertex by about half its whole length, which is equal to that of the following two or three joints, the pedicel subtriangular about equal to the second joint of funicle, the first funicle joint very long, about five times as long as wide, and with the second clothed on one side with conspicuous erect hairs, which are curved and dilated apically, with acute tips; rest of antennae with inconspicuous subappressed hairs, the third to the sixth joints of the funicle not differing much in length, being barely one-third as long as the first, but wider than this, club not evidently segmented, rather small, subequal to the three preceding joints only. Thorax with the acute tips of the axillae meeting inwardly, the scutellum very convex, compressed, so as to be obscurely carinate in the middle, the propodeum sparsely pilose at the sides. Wings with dark markings, the neuration very difficult to see in part, but the marginal vein is short, the stigmal moderately long, very oblique (i. e. more longitudinal than transverse), the postmarginal as long as the stigmal or a little longer. Hind tibiae apparently with no trace of a second spur, the calcar of the middle legs not so long as the first tarsal joint. Ovipositor not prominent.

### *Thysanomastix koebelei* sp. nov.

Dark brown, inclining to black in parts, antennae except the scape black or nearly so, abdomen also very dark or black, with the faintest trace of metallic tinge in some aspects; the insect generally being not at all metallic.

Head somewhat shining, there being a microscopic surface sculpture and some very feeble fine punctures, most noticeable on the front, about the eyes. Mesonotum slightly shining, clothed with short pale hairs, and having a feeble indefinite puncturation; scutellum with sparse longish hairs at the apex, where it extends over the propodeum, which is smooth and shining on the convex, or somewhat protuberant, sides. Wings mostly hairless on about the basal half; two-thirds from the base of this hyaline portion apically is a narrow transverse dark bar, densely hairy, extending from the submarginal vein, but not touching the costa, nor reaching the opposite margin; apical portion of wing hairy and largely occupied by a large blackish fuscous cloud, the stigmal, marginal and postmarginal veins still blacker, but the postmarginal appears to extend a little beyond this black area. Abdomen as long as the thorax, but much smaller in bulk, shining, depressed above, as is usual in dead Encyrtids, this being a usual post mortem change. Length 1.5 mm.

HAB. Nogales, Arizona; bred, no. 2444.

### *Saronotum* Perk.

This hyperparasite was bred (no. 2448b) from the cocoon of *Neogonatopus mimus* and appears to be almost or quite identical with the Australian form. I am therefore inclined to think that *Saronotum americanum* and *S. australiae* are one species, my original example of the former being merely a variation of the latter. Mr. Koebele captured what might be the male of *Saronotum.* It has longer antennae and only rudimentary wings and differs in other characters, such as are probably only sexual. Other instances of Chalcids that are parasitic on other Hymenoptera having flightless males and fully winged females are known to me, but I should hesitate to describe the specimen in question as a male of *Saronotum* without further evidence.

## *EULOPHIDAE.*

When in Australia, the possibility of the Tetrastichine, *Ootetrastichus beatus,* being hyperparasitic at once suggested itself to us, but the idea was discarded. Later on, breeding of the species in confinement for several generations made it appear certain that it was a primary egg-parasite, and not bred at the expense of the Mymarids. Subsequently Dr. L. O. Howard called my attention to the fact that theoretically it ought to be a hyperparasite. Ashmead has recently described certain Tetrastichines as being parasitic on Mymaridae, but without valid proof of the relationship. Accordingly I carried out some further experiments with *Ootetrastichus beatus,* raising cane-plants indoors in covered glass jars, then introducing leaf-hoppers and finally specimens of the parasite. In the two jars employed, every leaf-hopper egg that was laid in the leaves was destroyed by the *Ootetrastichus.* When young the larva lives within one of the hopper's eggs, like a Mymarid, but later on emerges and destroys the other eggs in the egg-chamber; then usually bores a gallery for some length in the midrib of the leaf, and pupates at the end of this. Whether the Chalcid would spare or pass by eggs parasitized by the Mymarids is uncertain, but it certainly readily destroys unparasitized eggs of the leaf-hopper.

## *TRICHOGRAMMIDAE.*

### *Trichogramma helocharae* sp. nov.

Yellow, or in life more or less green; head with a black transverse line on the occiput; thorax with slight dark markings, the chief of these in dorsal aspect of the insect being a marginal line on each side in front of the tegulae, a spot on each side just behind them, the front and hind suture of the scutellum more or less, and a spot at the hind angles of the propodeum. The pleura are considerably more infuscate or blackish-marked than the dorsum. Abdominal segments with a dark latero-marginal line more or less distinct. Wings with the marginal vein infuscate and a dark spot (including the stigmal vein) extends from it about half across the wing. Four or five of the hair lines are more distinct than others, those between the more distinct ones being mostly somewhat confused and indefinite, or only short.

Antennae with the scape about equal to the pedicel and funicle together, the pedicel twice as long as the two funicle joints together, the first of the latter longer than the second and sometimes showing signs of transverse division near the base, as if to form a second ring-joint, club longer than the pedicel, ring-joint and funicle joints together. Length .6 mm.

HAB. Alameda, California, and elsewhere in that state; bred from eggs of *Helochara communis*, no. 2440.

## *STYLOPIDAE* (Coleoptera)

In Arizona at Nogales Koebele bred males of *Halictophagus* from three species of leaf-hoppers, of which two belong to the Jassidae and one to the Delphacidae. The parasites themselves are very closely allied to and greatly resemble the Australian (and ? Vitian) *Halictophagus schwarzii*, but can be distinguished by the characters of the genital segments, though these are quite similar in general plan to those of the Australian species. I may note that this is the first time *Halictophagus* has been bred from a Delphacid, the common parasite of which is *Elenchus*. I should add also that since my former paper on the Stylopidae was written, I have found the latter genus to freely attack arboreal Delphacids as well as the graminivorous species. The species found most numerously stylopized in Arizona was *Oncometopia lateralis* in the nymphal stages (no. 2445); the second Jassid affected by *Halictophagus* was *Ceratagallia bigeloviae* no. 2522; the Delphacid that yielded the parasite is a species of *Stobaera* no. 2523.

## *EPIPYROPIDAE* (Lepidoptera)

Mr. Koebele found *Epipyrops barberiana* Dyar very commonly in Arizona affecting Issine, Amphiscepine, and Poecilopterine leaf-hoppers. This species differs very greatly in neuration from the Australian forms, though like them superficially. In the hind wings, veins 1a, 1b and 1c are well developed and veins 2-8 are all present. In the Australian genera one of the veins 2-8 is always absent and of these forms only *Palaeopsyche* has all the veins from 1-12 in the forewings. The cocoon of this moth is very similar to those of some Australian species, and has similar erect processes or lamellae on the dorsum, these processes being variable in number or form, as in the others.

## *PIPUNCULIDAE* (Diptera)

In Arizona at Nogales a parasitized Jassid (no. 2469) was found, from which a *Pipunculus* larva emerged and pupated on the twenty-ninth of September and yielded the fly on the twenty-ninth of October. It is a large species, quite resembling the Australian species of Div. I (Bull. I. p. 130) in all characters, except that the third antennal joint is hardly perceptibly produced at the apex, though somewhat pointed there. A second species of *Pipunculus* (female) quite distinct from this and belonging to my Section II of the Australian species was bred from *Amphiscepa bivittata*, no. 2447. It differs from any of these in having the third antennal joint only slightly produced at the apex, though acute. Koebele also procured other puparia of Pipunculidae, but from these no flies have emerged. In my introductory remarks, I have already recorded the breeding in Honolulu of the European *Verrallia aucta* and *villosa* from German puparia, as well as species of *Pipunculus*, all from Jassids. Koebele found the latter very common in meadows in Germany and many species were obtained.

# HEMIPTERA HOMOPTERA.

By G. W. Kirkaldy.

The few Hemiptera discussed in the following pages were collected merely on account of their being the hosts of certain parasites and were indeed not always in the best condition for describing, being parasitized by Dryinidae, and often dried up.

The thirteen specimens belong to twelve species, eleven genera, and five families. Two genera and seven species are apparently new to science.

The species are as follows:

1 *Gypona ramosa* sp. nov.
2 *Oncometopia lateralis* (Fabr.)
3 *Ceratagallia bigeloviae* (Baker)
4 *Poblicia thanatophana* sp. nov.
5 *Scolops cockerelli* (Fowler)
6 *Oliarus pima* sp. nov.
7 *Cochise apacheanus* g. and sp. nov.
8 *Amphiscepa bivittata* (Say)
9 *A. immaculata* sp. nov.
10 *Bruchomorpha mormo* sp. nov.
11 *Picumna ovatipennis* (Walker) ?
12 *Mistharnophantia sonorana* g. and sp. nov.

## *TETIGONIIDAE.*

### *Gypona* Germar.

### 1. *ramosa* sp. nov.

Allied to *G. marmorata* Fowler, as regards the position of the ocelli, the condition of the head and tegmina, &c.

Pale green, or greenish-testaceous; vertex with a short, narrow, longitudinal, brownish-yellow line on each side from the ocelli almost to the apical margin. Ocelli brownish-yellow. Pronotum with a transverse, sinuate pale fuscous line, also a blackish dot in the middle on each side below the eyes. Tegmina greenish testaceous, subhyaline, reticulate, all the areas ramose; veins green, margined narrowly with yellowish-testaceous; outer margin yellowish-testaceous, apical margin from apex of clavus to a corresponding point on the opposite side, very narrowly blackish.

Vertex transverse, produced nearly as far in front of the eyes in the middle as its basal length, subangulate, a little shorter than the pronotum, longitudinally sulculate in the middle. Ocelli placed in the middle of the vertex, about as far from the eyes as from one another. Head in profile, acute anteriorly and sublaminate. Tegmina apically acute, without appendix.

Female: ultimate segment somewhat deeply bisinuate, the central projection also notched.

Length 8⅞ mill.

HAB. Arizona, Nogales; (Koebele's no. 2466).

The only specimen before me is carded, but the metapleura appear to be lobately ampliate (not at all in the same plane as the subventral pleurites), a character I do not find mentioned in descriptions of the genus.

### *Oncometopia* Stal.

### 1. *lateralis* (Fabr.).

*O. lateralis* (Fabr.) Ball 1902 P. Iowa Ac. VIII, 45.

This species is distributed "from the Mackenzie River and Nova Scotia south throughout the whole continent, and to northern South America at least."

HAB. Arizona, Nogales (Koebele's no. 2445, August).

### *Ceratagallia* Kirkaldy.

### 1 *bigeloviae* (Baker).

*Agallia bigeloviae* Baker, 1896 Psyche VII, suppl. 26.
*A. bigelovia* Osborn & Ball, 1898. Proc. Davenport Ac. Sci. VII, 62.

Previously described from New Mexico, Mexico and California baja. The single specimen is distorted by parasitization, but I think the determination is correct.

HAB. Arizona, Nogales; (Koebele's no. 2457).

## FULGORIDAE.

### *Poblicia* Stal.

### 1 *thanatophana* sp. nov.

Allied to *P. pallidoconspersa* Distant, but the head is partly pale and the tegmina are colored and conspersed differently.

Black; apical margin of vertex and basal margin of frons, testaceous. Sterna and legs minutely speckled with white, the latter with a few larger white spots, also the bases of the lateral spines on the tibiae. Subcostal cell and apical third of tegmina with numerous (mostly transverse) minute hyaline spots. Wings apically hyaline, veins blackish, apical margin narrowly smoky, basal third opaque black, base pale blue. Abdomen laterally, and above (except basally), red, the pleurites spotted with black.

Length 14 mill. to apex of tegmina, closed.

HAB. Arizona, Nogales; (Koebele's no. 2519).

### *Scolops* Schaum

*Scolops* Schaum 1850 Ersch. & Grub., Cycl., Art. Fulg.
*Ornithissus* Fowler 1904 B. C. A., Hom. II, 114.

Fowler has redescribed *Scolops* and wrongly placed it in the Issidae.

#### 1 *cockerelli* (Fowler).

*Ornithissus cockerelli* Fowler op. c., 122, Pl. 12, f. 14.

Previously recorded from Juarez on the northern frontier of Mexico. Fowler has omitted mention of the fuscous marks on the tegmina, but figures some.

HAB. Arizona, Nogales; (Koebele's no. 2487 Sept.).

### *Oliarus* Stal.

#### 1 *pinna* sp. nov.

Blackish, keels of head and pronotum more or less ferruginous. Pronotum (except laterally), tegulae, antennae, the lateral extension apicalwards of the frons, etc., ferruginotestaceous. Tegmina hyaline, veins dark-brown, closely and minutely studded with blackish granules, some of which bear black hairs; subcostal vein ferruginotestaceous, narrowly bordered within with black; stigma black, whitish basally; there is a black spot, or rather suffusion, at the first forking of the brachial vein, and there is some brownish suffusion on parts of the apical third, both of cells and veins. Penultimate segment of rostrum, tibiae and tarsi, posterior margin of sternites, etc., dark ferruginous.

Vertex longer than wide, feebly carinate medianly, scarcely extending in front of the eyes; lateral margins forking at about three-fourths of the length of the eyes, the inner forks connected with frons by short longitudinal keels before meeting, the fossettes thus being pyriform, rather large, and partly visible dorsally. The frons is much shorter than the clypeus medianly, but is produced laterally nearly as far apically as the middle length of the frons, the apical margin thus being deeply emarginate apically in a rounded manner. Axillary vein of clavus, taken from its curving at the commissure, about three-fourths of the length of the stalk of the anal, running into the anal, basal of the middle of the latter. Brachial vein forked distinctly nearer the base than is the radial. Stigma narrow, elongate triangular. First and second segments of hind tarsi each with 5 uneven, rather large spines.

Length 8 mill.

HAB. Arizona, Nogales; (Koebele's no. 2518 Sept.).

## Fam. ASIRACIDAE.

### *Cochise* gen. nov.

Vertex very transverse, keels obsolescent, impressed transversely on the basal margin, about one-fifth wider than an eye; with the eyes very distinctly wider than the pronotum. Frons medianly impressed transversely by a deep line, the basal part with 2 widely separated keels (a puncture between them in the middle), uniting on the middle of the apical part, which narrows concavely towards the apex, where it is truncate. Genae almost obsolete. Antennae arising almost at the exterior apical ocular angle, flattened and carinately foliaceous, one-third longer than the maximum width of the frons, first segment wider apically than basally, second five-eighths longer than the first. Clypeus rather swollen, carinate medianly. Pronotum scarcely longer medianly than the head, hind margin obtuse-angularly emarginate, median keel entire, a puncture on each side; lateral keels distant apically and basally, arising anteriorly at the interior margin of the eye, curving at an acute angle near the hind margin to meet the eye again, enclosing a puncture. Scutellum with the lateral keels obsolescent. Legs simple. Tegmina with the radial forked a trifle nearer the base than is the brachial; 7 apical cells; the second and third apical veins have a common base, the third reforking near the apex. Hind tibiae with a small spine near the base, four uneven, large spines at the apex; the spur large and broad, three-sided, each side flat not foliaceous, there are a number of very minute spines, scarcely visible, on one edge. The first segment of the hind tarsi is longer than the others together and has about 6 spines.

### 1 *apacheanus* sp. nov.

Yellowish, browner on the frons. Clypeus and longitudinal lines on the fore and middle legs dark fuscous, hind legs testaceous. Metanotum and tergites subsanguineous. Tegmina hyaline testaceous, veins and granules concolorous; an elongate spot at apex of clavus, the inner margin broadly of apical third of tegmen, curving around to apex and a long suffused smudge on second apical vein, dark fuscous, but although the veins on these suffused parts are fuscous, the granules remain testaceous.

Pygophor long and narrow, lateral margins parallel.

Length 5 mill.

HAB. Arizona, Nogales; (Koebele's no. 2478).

Unfortunately only a single female, in bad condition owing to parasitization, of this interesting form. It is allied to *Perkinsiella* Kirkaldy and *Aracopus* Spinola, but is very different from anything hitherto described.

## ISSIDAE.

### *Bruchomorpha* Newman.

### 1 *mormo* sp. nov.

Black, partly with a brassy gleam. Legs yellowish, coxae and femora partly at least suffused with blackish. Vertex sublinear. Frons not very long, not extending outwards farther than the abdomen, in profile. Head nearly one-half higher than its width at the base between the eyes; sublateral keels of frons enclosing an oval, curved but not sinuate laterally. Puncturation much as in *B. oculata* Newman (probably generic). Tegmina formed much as in the latter species, or a trifle shorter, truncate apically, venation almost obsolete.

Length (female) 3 mill.

HAB. Arizona, Nogales; (Koebele's no. 2483).

The coloring agrees with the laconic description of *B. nasuta* Stal, but the frons is apparently much shorter.

### *Picumna* Stal.

1 ? *ovatipennis* (Walker).

? *P. ovatipennis* (Walker) Fowler 1905 B. C. A. Hom. II 128, Pl. XII. f. 29.

A single male may be this, but seems to have a longer vertex and scutellum. Fowler gives no structural details and has confused at least two species, for his var. (f. 30) is certainly not conspecific.

HAB. Arizona, Nogales; (Koebele's no. 2524).

### *Amphiscepa* Germar.

Melichar, in his monograph, does not clearly differentiate between this and *Acanalonia* Spinola, which I believe to be synonymous.

1 *bivittata* (Say).

HAB. Arizona, Nogales; (Koebele, Sept.). Widely distributed from Canada to Mexico.

.2 *immaculata* sp. nov.

Brownish-yellow, tegmina and legs greenish, wings milkwhite with fuscous veins. Head dorsally twice as broad as long, gently rounded anteriorly, the vertex sublinear, separated from the frons by a transverse keel. Frons apically subrectanglarly (a little acutely) emarginate, not nearly so deeply, however, as in *A. bivittata*. No median keel on the frons, lateral margins acutely keeled, fairly straight for over half the length. Scutellum with 2 sublateral keels, but no trace of a middle one. Costal margin of tegmina arched.

Length 6½ mill.

HAB. Arizona, Nogales; (Koebele).

Distinguished from any other "*Amphiscepa*" by the absence of stripes or spots, and from any "*Acanalonia*" by the short head and absence of a middle keel.

## *POEKILLOPTERIDAE.*

### *Mistharnophantia* gen. nov.

Vertex transverse, about as wide as the eyes together, subtruncate apically, carinate in the middle, lateral margins subparallel, scarcely extending before the eyes. Frons medianly keeled, and (with the exception of narrow, laterally rounded, lateral margins which are a continuation of the lateral margins of the vertex) raised, sloping flatly backwards and upwards, a part of the base, nearly as long as the vertex, being visible dorsally in front of the latter. This dorsal part of the frons is semicircular and impressed entirely within the margins, and, as implied above, is narrower than the vertex. Antennae small. Pronotum transverse, wider and a little shorter than the head, roundly arched anteriorly, slightly emarginate posteriorly. Scutellum bicarinate. Tegmina strongly decumbent, medianly convex, reaching posteriorly much farther than the abdomen. Costal cell broad, with cross veins; the radial and median springing from a common, short stalk, close to the brachial, but soon forking, the radial almost immediately reforking. The venation is rather obscure and ill-defined in places. There is no proper subapical line. The costal vein runs almost at right angles to the body, then curves roundingly to form the apical margin, almost at right angles again, meeting the commissure at, apparently, a very acute angle. Wings rudimentary (?). Hind tibiae with one spine.

### 1 *sonorana* sp. nov.

Brownish testaceous; a broad, dark fuscous stripe running from apex of head (dorsally) to hind margin of scutellum. Tegmina opaque, coriaceous, pale brownish yellow; veins partly concolorous, partly dark fuscous.

Length about 3⅞ mill.

HAB. Arizona, Nogales; (Koebele's no. 2498).

Only one specimen in bad condition, unfortunately, of this curious form; it is parasitized.

It is very Issine in appearance, but the granulation of the clavus and the structure of the head proclaim it to be Poekillopterine. It is probably allied to *Hypancyius* Fowler, which that author places, apparently incorrectly, in the Issinae.

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DIVISION OF ENTOMOLOGY

BULLETIN No. V

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

# The Sugar Cane Leaf-Roller

(Omiodes accepta)

With an Account of

## Allied Species and Natural Enemies

By OTTO H. SWEZEY

HONOLULU, T. H.
AUGUST 20, 1907

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# The Sugar Cane Leaf-Roller
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HONOLULU, T. H.
AUGUST 20, 1907

# LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the Hawaiian Sugar
Planters' Association, Honolulu, T. H.

GENTLEMEN:—I, herewith, submit for publication Bulletin V of the Division of Entomology, prepared by Mr. O. H. Swezey. This Bulletin gives a very complete account of the cane leaf-roller and of other species closely allied to this destructive insect.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

Honolulu, T. H., May 21, 1907.

## INTRODUCTION.

The cane leaf-roller and all the other moths of the genus *Omiodes* herein mentioned, are native to the Hawaiian Islands and occur nowhere else. It is a tropical and subtropical genus, other species occurring in South America, Central America, West Indies, Tonga Is., Fiji, Solomon Is., Malay Is.; Upper Burmah, and even to E. Siberia, the latter being the farthest north that any species occurs. There are 15 Hawaiian species, and about an equal number in the other localities mentioned.

Hampson[1] places *Omiodes* under *Phryganodes* as a synonym; but our species do not agree with his characterization of that genus in respect to palpi and vein 7 of forewing. Our species more nearly correspond with his characterization of the genus *Nacoleia*, another tropical and subtropical genus.

The only species of Hawaiian *Omiodes* whose caterpillars have been previously described are *O. accepta*[2] and *O. blackburni*[3]. The caterpillars of all species are very similar in general, but vary in size respective to the size of the species, and in markings on head, cervical shield, and the tubercles, as is well shown in the figures. The pupae of the different species vary little except in size and degree of coloration—some being lighter in color, others darker. They all have similar habits of feeding, and of rolling leaves or otherwise fastening leaves together for a "retreat," to protect them from their enemies. The life-history of the different species varies somewhat, but in general is much the same as given for *O. accepta* and *O. blackburni.* The caterpillars obtain their growth in about 3 to 4 weeks, and the pupal period is about 1 to 2 weeks, which gives 4 to 6 weeks from egg to maturity. As they breed more or less the year round, there is time enough for several broods per year—about 6 to 8, tho there are seasons when they breed less prolifically and grow less rapidly than at others; so that perhaps there may be really a less number of broods per year.

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[1] Hampson, the Fauna of British India, Moths, IV, p. 300, 1896.

[2] Dyar, Proc. Ent. Soc. Wash., VI, No. 2, p. 65, 1904.

[3] Dyar, Can. Ent., XXXII, p. 157, 1900.

As regards food-plants, the caterpillars of the different species are more or less restricted to particular food-plants. Four are grass-feeders: ***accepta***, ***continuatalis***, ***localis***, ***demaratalis;*** two feed on sedge: ***anastrepta***, ***antidoxa;*** two feed on ***Astelia*** (a Liliaceous plant): ***iridias***, ***asaphombra;*** one feeds on ***Dianella*** (another Liliaceous plant): ***monograma;*** one feeds on leaves of various species of beans: ***monogona;*** one species on palms: ***blackburni***; two species on banana: ***meyricki*** and ***blackburni***. With the exception of one species (***monogona***) it is seen they are confined to the Monocotyledonous group of plants. Of those feeding upon grass, ***accepta*** is the only species which also attacks sugar cane to such an extent as to be considered a pest; in fact, there are only occasional instances of any other species feeding upon cane.

## DESCRIPTIVE.

### Family *PYRALIDAE*

### Subfamily *PYRAUSTINAE*

### Genus *OMIODES* Gn.

The following characters of the genus are given by Meyrick in the Transactions of the Entomological Society of London, p. 254, 1886:

> Forehead oblique; ocelli present; tongue developed. Antennae five-sixths of forewings, in male moderately ciliated (1¼), rough scaled above. Labial palpi moderate, arched, ascending, with dense rough projecting scales beneath, terminal joint extremely short, obtuse. Maxillary palpi moderate, dilated with loose scales at apex. Thorax in male with patagia elongate, ending in a spreading pencil of long hairs. Abdomen in male elongate, with short anal tuft, valves retracted. Posterior tibiae with outer spurs one-third of inner. Forewings with vein 10 closely approximated to 9, 11 very oblique. Hind wings as broad as forewings; veins 4 and 5 closely approximated at base, 7 out of 6 near origin, anastomosing with 8 to near middle.

### *Omiodes accepta* (Butl.), Sugar Cane Leaf-roller (Plate I, fig 1).

"♂ ♀ 22-31 mm. Antennal ciliations one-third. Abdomen fuscous, segmental margins white, anal segment with two blackish marks Fore wings fuscous, darkest on costa towards base; veins whitish or whitish-ochreous; a dark fuscous dot towards costa at one-third; and a second (sometimes obsolete) in disc above middle; a dark fuscous fascia from beneath costa at three-fifths to one-third of inner margin, interrupted partially by veins, its anterior edge well-defined and preceded by an obscure ochreous-whitish line, slightly concave, posterior edge suffused; a nearly straight or faintly sinuous ochreous-whitish line from costa before apex to three-fifths of inner margin, anteriorly finely margined with dark fuscous, posteriorly followed by a rather broad dark fuscous suffusion; a thick interrupted blackish-fuscous hind-marginal line; cilia fuscous-whitish, with two fuscous lines, second sometimes suffused and obscure. Hind wings fuscous-grey; a transverse darker discal mark at one-third; a rather irregular nearly straight cloudy whitish line from costa at three-fourths to anal angle, preceded by a narrow and followed by a broader darker fuscous suffusion; hind-marginal line and cilia as in fore wings." [Meyrick, Trans. Ent. Soc. London, p 214, 1888.]

This is a native moth, and its caterpillars were probably originally grass-feeders, but at the present time they feed largely upon sugar cane. It is found especially in sugar plantations, or the portions of plantations, which are quite high, or are near to the native forests; for example the upper parts of plantations of the Kohala, Hamakua, Hilo and Kau districts of Hawaii, but it is generally distributed however,—a few found in nearly all, if not all, of the plantations of these islands, but scarce in the irrigated plantations of the dry districts. Besides feeding upon sugar cane, it is also found along with other species of Omiodes, feeding upon Hilo grass (*Paspalum conjugatum*), *Paspalum orbiculare*, *Panicum pruriens*, and other grasses. I have also found the caterpillars feeding upon Pampas grass, and on a native sedge, *Baumea meyani*.

It is present in some fields of cane sometimes in such large numbers as to do considerable damage, in fact cases have been reported where the young cane has been entirely stripped of leaves. Such instances are not numerous, however, and even in the worst cases would not result in entire destruction of the crop of cane as it would grow again after the caterpillars had obtained their growth, or their parasites had got them checked. It is not usually to be considered a serious pest. Possibly it is not so abundant now as it was a few years ago when reports were made of cane fields having been entirely stripped by them.

At present there are a number of parasites preying upon this species and this keeps them well in check.

## Life History

The eggs are deposited on the surface of a grass or cane-leaf, usually on the upper surface, in the groove of the mid-rib of the leaf (Plate I, figs 8, 9). They are in clusters of from 2 or 3 to as many as 30, and quite regularly arranged in rows, (when but a small number they are in one row) and a little overlapping like shingles. They are flat, nearly circular, about ⅔ mm. in diameter, very finely reticulated on both surfaces, slightly yellowish with a slight iridescent hue which shows more distinctly after hatching. Just previous to hatching, the young larvae may be seen coiled around inside the egg. They are conspicuous by their black heads.

Freshly hatched larvae are 1.5 mm. long. They are pale greenish; head black; no markings on the other segments; tubercles and hairs are conspicuous.

2nd Stage.—About 4 mm.; pale green; head with black spot at cluster of ocelli, a black dot in middle of each lobe in front; a black dot at postero-ventral angle, a black line on margin above it.

3rd Stage.- About 7 mm.; pale green; head as before; a black spot in each lateral lobe of cervical shield, a black dot behind each spot; on segment 3 tubercles ii are heavily black-margined below and in front.

4th Stage.—About 12 mm.; all marks are more conspicuous; the dot and spot in each lobe of cervical shield are united; a faint oblique dash on each side above paraclypeus.

5th Stage. About 20 mm.; the markings are the same as in previous stage, and a faint black lateral margin to the cervical shield.

6th Stage.- (Plate I, figs. 2-5). Full-grown, 27 mm. Head rounded, slightly bilobed, pale luteous, upper part checkered with angular slightly darker spots; a rounded black spot about the middle of each half of face, two little oblique dashes a little above these and near median line, the black dot at postero-ventral angle in earlier stages is no longer present; ocelli black, except the lower posterior one; tips of mandibles black; tips of antennae brown. Body slender, cylindrical, uniform green, the dorsal vessel edged by a more or less distinct, opaque, white fat-body, the tracheae along sides show very distinctly through the integument. Tubercles broad, flat, somewhat convex, same color as body, each bearing a seta (certain ones 2 setae), arranged in several longitudinal rows; one tubercle per segment on each side of body. They are to be designated as follows: those on the dorsum are **anterior trapezoidal** (i) and **posterior trapezoidal** (ii), near the anterior and posterior margins respectively of segments 5–12*, the former are nearer the median line, on segments 3 and 4 each of these tubercles is double, i. e., has two setae, and ii is situated ventrally from i, instead of posterior to it; **supra-spiracular** (iii), a tubercle situated just above each spiracle, also one in a nearly corresponding position on segments 3 and 4; **sub-spiracular** (iv + v), a double tubercle just below each spiracle, it is composed of two united and bears two setae, on segments 3 and 4 it is in front of iii, on segment 2 it is in front of the spiracle (**pre-spiracular**); lateral (vi), a tubercle a little below iv + v and situated a little farther back; **marginal** (vii), situated on outer side of each proleg, and on inner side of each true leg, and on legless segments a little ventral from vi, each has three setae; **ventral** (viii) a small tubercle near median ventral line of each segment. Cervical shield same color as body, has two black spots near each lateral margin, the anterior spot the larger, sometimes the lateral margin is faintly black. On segment 3, tubercle ii is more or less black-margined on its lower and anterior sides, making a conspicuous black spot in line with those on cervical shield. Feet same color as body; spiracles yellowish-brown, those of segments 2 and 12 larger than the others.

The recently hatched larva feeds in the folded together tip of a grass leaf which it has fastened with silk. It eats the surface of the leaf in spots, leaving the under epidermis, which gives the appearance of dead spots on the leaf (Plate I, fig. 11); as it becomes larger it folds the leaf together lower down, doing this from time to time as it needs to enlarge its retreat, or have access to a fresh portion of leaf for feeding. In about two weeks the larva has grown to a length of 15 mm., and now eats the whole substance of the leaf, not leaving the epidermis as before. Having used up one leaf, the larva migrates to another, by spinning, rolls a portion of it into a tube (Plate I, fig. 10), within which it hides, protruding its head at the ends of the tube to feed upon the leaf; eventually its "retreat" becomes reduced by being eaten at the ends, and another leaf has to be taken, and so on, till the larva reaches its growth. Often a larva fastens several leaves together confusedly for a retreat, instead of rolling up just one.

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* In numbering segments, the head is 1, prothorax 2, and the others in succession.

On sugar cane the very young larvae feed in the crown of the plant where the young leaves have not yet unrolled. They are thus protected between the natural rolls of the leaf; later on they roll over the margin of a leaf forming a tube for their "retreat." When nearly full grown, they are usually found in tubes towards the tip of the upper leaves. These tubes are easily observed if the ragged leaves where the larvae have fed, are examined. The work of the smaller larvae shows as oval or elongate dead spots on leaves which have unrolled in the growing of the cane after the young larvae have fed upon them.

When disturbed in its retreat, as by its being torn open, or violently shaken, or jarred, the larva wriggles very lively and drops to the ground for escape. This habit is probably to escape from parasites, many of which prey upon them. The retreat which it constructs, is undoubtedly for the same purpose, as well as for protection from wasps and birds which prey upon.

The caterpillars are full-grown in about 3 weeks from hatching. They molt 5 times at intervals of about 3 to 5 days, and 5 to 7 days between the 5th molt and the spinning of the cocoon and pupation. Pupation takes place within a slight cocoon of white silk in the "retreat" where the caterpillar has lived; however, the cocoon is sometimes made beneath the leaf-sheaths of cane, and in other favorable places.

Pupa.—(Plate 1, fig. 6). Length 12–14 mm., width about 2.5mm.; light brown, head darker; delicate hairs distributed as in the larva; cremaster somewhat flattened, blunt-pointed, with a cluster of 8 hooked spines fastened into the cocoon; spiracles slightly raised; wing-cases extending to the middle of the fourth abdominal segment, antenna- and leg-cases extending to about the middle of the sixth segment, free beyond the fourth segment.

The pupal period is 8 to 13 days, usually about 10 days.

*Omiodes localis* (Butl.) (Plate II, fig. 1).

"♂ ♀ 17–23 mm. Antennal ciliations one-third. Abdomen light fuscous, segmental margins whitish. Fore wings light fuscous; a dark fuscous line from one-fourth of costa to one-third of inner margin, angulated in middle, upper half indistinct, lower half well-marked; a dark fuscous dot in disc at two-fifths, and a transverse-linear mark beyond middle; a dark fuscous partially indistinct line, followed by a band slightly paler than ground colour, from two-thirds of costa to three-fifths of inner margin, upper half unevenly but moderately strongly curved outwards, the paler band followed by a somewhat darker suffusion; an interrupted blackish hind-marginal line; cilia whitish-fuscous, with a dark fuscous line. Hind wings light fuscous; an obscure darker transverse discal mark at one-third; a cloudy darker fuscous line from three-fifths of costa to inner margin above anal angle, rather bent in middle, beneath this rather irregular; a dark fuscous hind-marginal line; cilia whitish, with a dark fuscous line." [Meyrick, Trans. Ent. Soc. London, p. 217, 1888.]

This species is common on all the larger islands of the Hawaiian group, It is perhaps the most common species of those which are particularly grass feeders. The caterpillars are grass feeders, occurring with *O. accepta*. I have found them feeding on *Panicum pruriens*, *Paspalum conjugatum* (Hilo grass) and *Oplismenus compositus* ("Honohono" grass).

Full-grown caterpillar.—(Plate III, fig. 3). Length about 20 mm.; head similar to *O. accepta* with the addition of brownish markings on the vertex and sides, and a black dot at the postero-ventral angle of head. Cervical shield with black margins to its lateral lobes; two black spots in each lateral lobe, the anterior one twice as large as the posterior one, sometimes they are united; on the level with these spots is a brownish one between segments 2 and 3; black upper margin to the tubercle in front of spiracle. Tubercle ii of segment 3 has black lower margin, thickened anteriorly; on segment 12 tubercle ii has black ventral margin, and tubercle iii has black dorsal margin, thickened posteriorly.

Pupa.—10 mm. long, medium brown, eyes black, hairs and cremaster similar to *O. accepta*; antenna- and leg-cases extending a little beyond 6th abdominal segment, free beyond 4th segment. Pupa formed in slight cocoon where the caterpillar lived. Pupal period 8–11 days.

*Omiodes demaratalis* (Walk.) (Plate II, fig. 3).

"♂ ♀ 21-24 mm. Antennal ciliations one-fourth. **Abdomen light** ochreous, segmental margins white. Fore wings yellowish-ochreous, more or less tinged with reddish or brownish; costa suffused with rather dark fuscous from base to three-fourths; a dark fuscous dot in disc at two-fifths, and a small transverse-linear dark fuscous mark beyond middle; an almost straight white line from beneath costa at three-fourths to inner margin at two-thirds, anteriorly margined with dark fuscous; a hind-marginal row of blackish dots; cilia grey-whitish, with a grey line. Hind wings whitish-fuscous, towards hind margin becoming pale ochreous; a dark grey transverse discal mark at one-third: a strong white line from beneath costa beyond middle to anal angle, margined anteriorly with dark fuscous; an interrupted blackish hind-marginal line; cilia white, with a grey line." [Meyrick, Trans. Ent. Soc. London, p. 216, 1888].

This moth has been recorded from Oahu, Kauai, and Hawaii. It is less common than the other grass-feeding species of *Omiodes*, but I have sometimes seen them quite abundant locally. The caterpillars probably feed on several species of grass. I have found them on *Panicum pruriens* and *Paspalum conjugatum* (Hilo grass). They feed similarly to *O. accepta*.

Full-grown caterpillar.—(Plate III, fig 4). Length 22-25 mm.; grass-green where the contents of alimentary canal show thru, otherwise pale yellowish; head testaceous, a black spot including ocelli, a round black spot in middle of each half of face in front, a tiny blackish dot on postero-ventral margin of head, some pale brownish mottling on upper part of head; mandibles brown, apical half black. Cervical shield with a strong black posterior and lateral margin, interrupted in median line behind; a few tiny dots near dorsal anterior margin, also a few faint ones near posterior margin; a large black spot, with a smaller one behind it in each lateral lobe of cervical shield; tubercles iv. + v. and vi. are partially brown-margined. Tubercles i, ii and iii of segment 3, and i and ii of segment 4 have black margins, not always complete, heaviest on anterior margin; tubercles i, ii and iii of segments 11, 12 and 13 are mostly marked with black in some part of the margin, sometimes some of them entirely surrounded; often some faint markings on some of the tubercles of the other segments, sometimes forming two rows of faint marks a little above the line of spiracles.

Pupa.—12 mm. long, very dark brown; spiracles slightly raised; hairs very delicate, distributed as in other *Omiodes*; cremaster blunt-pointed, with 8 hooked spines. Pupa formed in place where the caterpillar had lived. Pupal period about 12 days.

*Omiodes continuatalis* (Wall.) (Plate II, fig 2).

"♂ ♀ 27-31 mm. Antennal ciliations one-fourth. Abdomen light greyish-fuscous, becoming blackish-grey posteriorly, segmental margins white. Fore wings rather dark fuscous; a narrow white central longitudinal streak from base to near middle; a slender white longitudinal streak in disc above middle from one-third to two-thirds, sometimes obscure; sometimes a dark fuscous dot in disc at one-third and another in middle, especially in female; a strong nearly straight white line from immediately beneath costa at three-fourths to inner margin at two-thirds, thence slenderly produced along inner margin to one-third, sinuate inwards below the middle, anteriorly edged with darker; a whitish irroration forming an obscure hind-marginal border; a thick interrupted blackish-fuscous hind-marginal line; cilia fuscous-whitish, with a thick fuscous line. Hind wings fuscous; an obscure darker discal spot at one-third; a strong nearly straight white line from beneath costa at two-thirds to anal angle, slightly sinuate near lower extremity, preceded by a cloudy dark fuscous line; a thick blackish-fuscous hind-marginal line; cilia white, with a dark fuscous line." [Meyrick, Trans. Ent. Soc. London, p. 215, 1888].

This moth occurs commonly on all of the islands of this group; in some localities very abundantly. Its chief food plants so far as I have observed are *Heteropogon contortus* ("Pili" grass) and *Paspalum comjugatum* (Hilo grass). On one occasion I saw the moths very numerous in a field of introduced grass at Olinda, Maui, but I could find no caterpillars at the time, altho they had presumably fed on this grass. Mr. Terry has reported it in one instance feeding on sugar cane on Kauai.

The caterpillars of this species are in the habit of hiding among the mass of dead leaves at the base of tufts of grass, and feeding on the lowermost accessible green leaves instead of feeding on upper leaves and hiding in a rolled up leaf, as several of the other species of *Omiodes* do. However, where several were feeding on grass in a breeding cage, one caterpillar rolled up a leaf to hide in. The pupa is formed in a slight cocoon in the same place that the caterpillar had for a hiding-place. Pupal period is about 12-15 days.

Full-grown caterpillar.—(Plate IV, figs. 1-3). Length 28-30 mm.; testaceous-green, with a rosy tinge; hairs situated in black dots on the broad flat tubercles; head testaceous, two roundish black spots in front, one in middle of each lobe of face, two small blackish markings on the sutures near middle and a little higher up, postero-lateral margins of head slightly browned; a black spot including the ocelli, except the lower outer one; mandibles brown, black at apex. Cervical shield with two small black dots in middle near anterior margin; in each lateral lobe a large black spot and a tiny one behind it, lateral margin brown. The tubercles below the spiracles of segment 2, and all tubercles of the other segments are more or less blackish-brown margined, those of the three posterior segments most pronounced; tubercles i and ii of segment 3 often partially joined; in younger caterpillars tubercles of segments 3, 4, 11, 12 and 13 are mostly black; spiracles of segments 2 and 12 are larger than the others.

Pupa.—Length 13-15 mm.; very dark brown; hairs as usual with *Omiodes* pupae; cremaster blunt-pointed, with a cluster of hooked spines at apex; antenna- and leg-cases extending to near the posterior margin of the 6th abdominal segment, free beyond the 4th segment.

*Omiodes anastrepta* Meyr. (Plate II, fig 7)

"♀ 28-29 mm. Head thorax, and abdomen fuscous. Palpi dark fuscous, lower half white. Fore wings moderate, termen faintly sinuate beneath apex; rather dark fuscous, more or less whitish-sprinkled; first line whitish, angulated above middle, nearly or quite obsolete above angulation, lower portion margined posteriorly by a thick blackish-fuscous streak which is nearly rectangularly bent and continued beneath median vein to discal mark, this angle sometimes filled with dark suffusion; a small black orbicular dot; a transverse blackish discal mark; second line whitish, slighly sinuate beneath costa, edged posteriorly by a suffused dark fuscous band, and sometimes anteriorly by a series of dark fuscous dots; a terminal series of blackish dots. Hind wings rather dark grey a paler slightly sinuate postmedian line, edged anteriorly with dark grey dots, and posteriorly by a band of dark grey suffusion; a terminal series of blackish dots." [Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 204, 1899].

The male is similar to above description of female.

This is a rather rare species. It has been collected in Kona, and

Kilauea, Hawaii; in the mountains of Molokai; and in Koolau mountains above Waialua, Oahu. The caterpillars feed on sedges, probably on but a single species, (*Carex oahuensis*), for where I collected quite a number of caterpillars at Kilauea, they were all on this species of sedge, altho there were several other species growing inter-mixed at the same place. They feed in the crown of the sedge plant, eating the newer leaves and spinning them together for a "retreat." From these caterpillars I succeeded in rearing several moths of both sexes. I caught one male in the same place. But one specimen was taken by Dr. Perkins in each of the other localities mentioned.

Caterpillar.—(Plate III, fig. 5). When full-grown, about 25 mm. long; bright green; head paler and slightly testaceous above; ocelli black; two rounded spots on face, outside of each is another, not so regular in shape, which makes a nearly horizontal row of four spots; two elongate spots extending from near the top of head obliquely downward in front nearly to the two inner spots of the horizontal row of four, above these there are often two small dots and outside of the latter on the top of the head is a black spot on each side of the head, often two or three irregular ones close together or more or less connected; sometimes there is a black bar extending obliquely outward and upward from each of the round spots in front of the face. Cervical shield without black lateral margins; two black spots in each lateral lobe, the anterior one larger and slightly elongate; two spots near anterior margin, wide apart, often a tiny dot outside of each. Segment 3 with tubercles i and ii mostly black. Often tubercles i and ii of segment 4, and i, ii and iii of segment 12 slightly marked; those of the other segments are unmarked, and less conspicuous than is usual with *Omiodes* caterpillars; tubercles i and ii of segment 3 strongly conical as compared with the others, those of segment 4 somewhat conical also.

Pupa.—About 11 mm. long; pale brownish, with greenish tinge on thoracic region; eyes nearly black; wing-cases extending to posterior part of 4th abdominal segment, the pointed apex extending one segment further and free; leg-cases and antenna-cases extending to posterior margin of 6th segment, free beyond 4th segment; cremaster short, blunt-pointed, with several hooked spines. Pupal period about 15 days.

*Omiodes antidoxa* Meyr. (Plate II, fig. 8).

" ♂ 24 mm. Head, thorax, and abdomen light fuscous, mixed with whitish, anal tuft mixed with dark fuscous. Palpi dark fuscous, lower half white. Fore wings moderate, apex rather prominent, termen sinuate beneath it; light fuscous, mixed with whitish-ochreous; first line represented by a thick black streak from ¼ of dorsum to beneath discal spot, its upper edge very obtusely angulated-prominent beneath orbicular dot; a black orbicular dot, and small transverse-oval discal spot; second line obsecurely pale, followed by a thick blackish posteriorly suffused streak, straight except toward costa, where it curves towards apex; a terminal series of blackish triangular dots. Hind wings tuscous, mixed with whitish-fuscous; a cloudy dark fuscous discal dot; a straight pale postmedian line, edged posteriorly with dark fuscous suffusion; an interrupted dark fuscous terminal line." [Meyrick, Fauna Hawaiiensis, III, Pt. IV, p. 358, 1904.]

Aside from sexual characters the female is similar to above description.

This is a very rare species. A few specimens were collected by Dr. Perkins in Koolau mountains above Waialua, Oahu. I have reared several moths from caterpillars found feeding on a sedge (*Rhyncospora thyrsoidea*) in the mountains above Palolo, Oahu. My specimens may possibly be a new species; but they only differ from the specimens of *antidoxa* collected by Dr. Perkins, in being a darker shade and the orbicular dot less conspicuous, often absent, and in having a wider space beyond second line of fore wing.

On two different occasions I collected caterpillars from a certain patch of sedge in the Palolo locality mentioned above; but altho the same species of sedge was abundant in other places on the ridge, I found none of the caterpillars elsewhere. They probably feed upon but the one species of sedge; however, in rearing them in breeding jars they readily fed on a different species of sedge, *Cyperus rotundus*, the species which is such a nuisance in many lawns, gardens and some sugar plantations, commonly called "Japanese grass," "nut grass," and "bulb grass." The caterpillar usually feeds in the heart of the sedge plant, eating the newer leaves, and spinning them together for a "retreat."

### Life History

A cluster of 3 eggs were found on the groove of the middle of upper surface of a sedge leaf. They are similar to the eggs of *O. accepta*. They hatched the next day. The tiny caterpillars were whitish, with black heads. Length 1.5 mm. One was bred thru to maturity, fed upon *Cyperus rotundus*. The first molt occurred on the third day. It was then light green, and the head was no longer black. When about 5 mm. long, it was pale green; head with 2 black spots in front, black ocelli, and a dot at each postero-ventral angle; cervical shield with black spot in each lateral lobe; tubercle ii of segment 3, black.

When 10 days old it was 11 mm. long. The head now has the two round black spots in front, black eye-spots, and a black dot at each postero-ventral angle. Cervical shield, and segments 2 and 12 have the markings of full-grown caterpillar.

After a moult about the 12th day, it was 13 mm. long. In addition to above markings there are also present on the head, two large black spots on each side above the eye-spot, and two faint short oblique bars in front near middle and near the top of the head. This is very near to the markings of full-grown caterpillar.

Not all of the molts were observed, but when 20 days old the caterpillar was about 25 mm., full-grown, and had begun to spin a cocoon.

Full-grown caterpillar.—(Plate III, fig. 6). Bright green, darker along dorsal vessel; head testaceous, with the usual rounded black spot in each lobe in front, ocelli black, above the ocelli on each side of head three large irregular spots, two oblique bars near middle of top of head in front, the black dot at postero-ventral angle of younger stages is not present. Cervical shield without black margin, a black bar followed by a dot in each lateral lobe, two tiny black dots near middle in front. Tubercle ii of segment 3 faintly black-margined below, and very strongly in front, broadly conical, higher than the other tubercles. Tubercles i, ii and iii of segment 12 faintly black-margined. Among other caterpillars bred, sometimes the tubercle in front of spiracle of segement 2, tubercle i of segment 3, and tubercle ii of segment 4, are faintly blackened on some part of margin. The incisures between segments are very shallow, giving the caterpillar a very smooth surface.

Pupa.—12 mm. pale brown with greenish tinge especially in thoracic region, a greener median line on dorsum of abdomen, eyes darker; wing-cases extending to apex of 4th abdominal segment, apical point a little further, antenna- and leg-cases extend a little beyond apex of 5th abdominal segment, free beyond 4th segment; cremaster short, blunt, with 8 hooked spines fastened into the cocoon. The cocoon is slight and made in the retreat where the caterpillar lived. Pupation takes place in 2 to 4 days after the cocoon is started. Larval period 20 to 22 days; pupal period 10 to 11 days.

*Omiodes monogramma* Meyr. (Plate II, fig. 9).

> "♂. 25–29 mm. Head and palpi deep ferruginous, lower half of palpi white. Thorax ferruginous, posteriorly paler and mixed with whitish-ochreous. Abdomen ferruginous–ochreous, segmental margins usually finely white. Forewings moderate, termen gently bowed; ferruginous; costa suffused with dark fuscous from base to ⅗; second line about ¾, almost straight, white, obsolete on costa, posteriorly edged with fuscous suffusion; a dark fuscous terminal line; cilia grey, with darker sub-basal line. Hindwings fuscous, usually suffused with dull ochreous towards dorsum; a white postmedian line, obtusely angulated near tornus, posteriorly edged with dark fuscous suffusion, beyond which the terminal area is wholly ferruginous-ochreous; a dark fuscous terminal line; ciali whitish, with dark grey sub-basal line.
>
> Allied to *O. demaratalis*, but differs by the larger size, ferruginous colouring, absence of orbicular and discal dots, second line of forewings placed nearer termen, and postmedian line or hindwings obtusely angulated and followed by dark fuscous suffusion." [Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 205, 1899.]

The females have less fuscous suffusion than described above for the males. Sometimes these are faint fuscous orbicular and discal dots in forewings, and a faint discal dot in hindwings.

This species is common locally in the mountains of Kauai, Oahu, and Hawaii. Its distribution is restricted to the regions where its food plant grows, as the caterpillars apparently feed upon but one species of plant, a native Liliaceous plant (*Dianella odorata.*) The caterpillars feed inside a leaf folded together along the mid rib, so that the margins come together above. The leaf when young is folded thus and if the caterpillars take possession at this time, they can easily fasten the edges so that the leaf will not open. I have found them sometimes within a leaf folded together below, which would be a more difficult matter to accomplish. Usually there is one larva to a leaf, but I have often found several, in one instance 7 were found in one leaf. When young, they begin feeding at the apex of the leaf; and gradually work downward, folding together more and more of the leaf as they need it for a hiding place. They eat the substance of the leaf except the lower epidermis, which is left in a dried up condition enclosing a mass of "frass" which the caterpillars have produced. Pupation takes place with only a slight cocoon, within the folded leaf.

Caterpillar.—(Plate III, fig. 7). Length about 20-22 mm.; pale yellowish green; head similar to *O. accepta* except that the two oblique marks near top of head in front are absent, the two spots in the face are much smaller and fainter, and there is a black dot at each postero-ventral angle of head. Cervical shield with black lateral and posterior margin, fainter posteriorly, often interrupted in dorsal part; two black spots in lateral lobes, the anterior one elongate, the posterior one a mere dot. Tubercles i, ii, iii and iv + v of segment 3 very conspicuously black-margined, those of segment 4 nearly as black-margined, and i, ii and iii of segments 11 and 12 are also nearly as black-margined, those of the other segments more or less margined also.

Pupa.—Length 12-14 mm., very pale uniform brownish; leg- and antenna-cases extending a little beyond 5th abdominal segment; in other respects similar to other *Omiodes* pupae. Pupal period about 12-14 days.

*Omiodes iridias* Meyr. (Plate II, fig. 6).

"♂ ♀. 27-28 mm. **Head and thorax dark fuscous, with white line above eyes. Palpi dark fuscous, lower half white. Forewings rather long, termen slightly sinuate beneath apex; dark fuscous, irrorated with dull purplish; lines obscurely paler, first obtusely angulated above middle, obsolete on costa, second very obtusely angulated below middle, straight or slightly curved on upper portion, sinuate inwards below angulation; enclosed median band in ♂ hardly darker, somewhat ferruginous-mixed on dorsal half, in ♀ blackish except towards costa, upper** edge excavated on anterior half, with a blackish orbicular dot in excavation before middle; a terminal series of dark fuscous or blackish dots; cilia fuscous, with darker subbasal line. Hindwings rather dark fuscous; an obscurely paler slightly sinuate postmedian line, anteriorly darker-edged; cilia as in forewings." [Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 203, 1899.]

This species is not common, except very locally, on account of the distribution of its food-plant. The caterpillars have been found on only one species of plant, Silver Sword *(Astelia veratroides)*, one of the few native species of Liliaceous plants. The plant grows on exposed ridges or slopes at elevations of 2000 to 6000 feet; often very abundant. So far, this moth and its caterpillars have been collected only at Kilauea, Hawaii. I have found the catterpillars very numerous, but failed to rear more than a single pair to maturity. Dr. Perkins has also bred a male and a female from caterpillars from the same place.

The caterpillars feed on the inner leaves at the crown of the plant, and between leaves where they are close together. When small, they are much hidden by the dense woolly material which covers the surface of the leaves, especially when young. They eat one surface and the mesophyll of the leaf, leaving the opposite epidermis.

Caterpillar.—(Plate III, fig. 2). Length about 27 mm.; rather slender; pale whitish green, the dorsal line brownish, younger ones quite pale. Head similar to *O. accepta*, with the addition of black dot on postero-ventral margin, and a brownish dot above ocelli. Cervical shield has black lateral margins; two black spots in lateral lobes, the anterior ones elongate, the posterior ones round; two tiny dots near the middle near anterior margin; the tubercle in front of prothoracic spiracle has a little black on upper margin; two brownish spots on each side between segments 2 and 3. Tubercle i of segment 3 is a little blackened on lower margin, and tubercle ii is heavily black-margined all around except a little space on the upper side. Tubercles i and ii of segments 11 and 12 are more or less faintly margined all around, and tubercle iii of segment 12 is more heavily margined on upper side. Tubercles of some of the intermediate segments often family margined.

Pupa.—15 mm.; medium brown; wing-cases extending to apex of 4th abdominal segment, leg- and antenna-cases extending to about the middle of 6th abdominal segment, free beyond the 4th segment; cremaster truncate triangular, with 4 pairs of hooked spines fastened into the cocoon. Very similar to other *Omiodes* pupae. Pupation takes place in a slight cocoon in the catepillar's "retreat."

*Omiodes asaphombra* Meyr. (Plate II, fig. 5).

"♂. 35 mm. Head, thorax, and abdomen fuscous. Palpi fuscous, lower half white. Forewings long, termen slightly sinuate; fuscous, somewhat mixed with whitish and darker; a very broad dark fuscous median band mixed with ferruginous, not reaching costa, anterior edge straight, anterior half of upper edge excavated, with a dark fuscous orbicular dot in excavation before middle, posterior edge wholly suffused and undefined; a terminal series of dark fuscous dots. Hindwings rather dark fuscous; a slightly paler postmedian shade, darker-edged, obtusely angulated in middle." [Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 202, 1899.]

Female of similar coloration to the male.

This is a rare species. So far it has been collected only at Kilauea, Hawaii, the Waimea Mountains of Kauai, and the mountains above Palolo, Oahu. The caterpillars feed only on Silver Sword *(Astelia veratroides)*, and, hence, the species is restricted to those localities of the mountains where this plant grows. I have found the caterpillars feeding between the leaves at the crown of the plant where they are close together. They eat the surface and substance of the leaf, leaving the opposite epidermis, which shows as dead portions of the leaves. In some small plants, I found the caterpillars boring down into the stem where they had been feeding between the leaves in the middle of the crown of the plant.

Caterpillar.—(Plate III, fig. 1). Full-grown about 27 mm.; bright green if they have been feeding on the greener leaves, paler if they have fed in the inner part of the crown where there is very little chlorophyll in the leaves; darker green along the dorsal vessel. Head very pale testaceous, the two black spots on the the face are much smaller than they are in the other *Omiodes* whose caterpillars are known; ocelli black, a black dot at each postero-ventral angle. Cervical shield with black lateral margin, heavier anteriorly; a large and a small black spot in each lateral lobe, the small one posterior to the other; two tiny dots near middle of anterior margin; tubercle in front of spiracle faintly blackened on upper margin. Tubercle ii of segment 3 has heavy black ventral margin, especially anteriorly. Some markings on margin of tubercles i, ii and iii of segment 12; tubercles of other segments unmarked.

Pupa.—12 mm. long; uniform very pale brown; wing-cases extend to posterior margin of 4th abdominal segment, leg-cases and antenna-cases extend about one and a half segments farther; otherwise similar to *O. accepta*. The pupa is formed in slight cocoon in the caterpillar's "retreat." Pupal period 11 to 12 days.

*Omiodes blackburni* (Butl.) Palm Leaf-roller (Plate II, fig. 10).

"♂. 30 mm. Antennal ciliations one-fourth. Abdomen pale ochreous, segmental margins white. Fore wings pale brownish-ochreous, veins ochreous-whitish, separated at origin by a dark fuscous suffusion; an ochreous-whitish line, acutely angulated outwards in middle, from one-fourth of costa to one-third of inner margin, posteriorly margined with dark fuscous, anteriorly by a broad dark fuscous suffusion between veins; an ochreous-whitish transverse discal spot; an ochreous-whitish line from three-fourths of costa to three-fifths of inner margin, sinuate outwards beneath costa, below middle forming an acute triangular projection outwards, anteriorly margined with dark fuscous, posteriorly by a broad dark fuscous suffusion between veins; a slender interrupted dark fuscous hind-marginal streak; cilia whitish-ochreous, with a fuscous line. Hind wings rather densely haired towards inner margin; pale whitish-fuscous; an indistinct darker discal spot; a cloudy whitish line from two-thirds of costa to anal angle, with an acute projection outwards in middle, anteriorly narrowly, posteriorly broadly suffusedly margined with dark grey; a slender dark grey hind-marginal streak; cilia whitish, with a dark grey line." [Meyrick, Trans. Ent. Soc. London, p. 214, 1888.]

Expanse of males often 35 mm.; females 33-38 mm. The females are usually paler than the males, have less fuscous suffusion, often with ferruginous-ochreous suffsion in fore wings, and the lines less distinct.

This is about the largest of our *Omiodes* species. It occurs on all of the islands of the group, especially where coconuts grow. The caterpillars feed on the leaves of various species of Palms, particularly Coconut Palm. They are said to feed on Banana also; but I have never seen them on Banana. It is a serious pest on the Coconut Palm, causing the leaves to have a very ragged, unsightly appearance.

### Life History

The eggs are laid in regular rows in a narrow mass by the side of a rib of the leaf or leaflet. They are much flattened, roundish, and overlap similarly to shingles. I have counted as many as 84 in one cluster, but usually a less number, about 30-50. The young larvae feed gregariously on the under side of leaf, protected by a thin web of silk. At first they eat the substance of the leaf, and leave the opposite epidermis. They soon scatter more or less, and make hiding places by fastening together the lower edges of coconut leaflets, often several caterpillars in the same place. As they become a little larger, they eat the whole substance, eating from the edge, and not leaving the epidermis. As they get the leaflet mostly eaten, they migrate to other leaflets, and where they are numerous they soon mutilate every leaflet of the leaf. The caterpillars are full-grown in about 4 weeks from hatching. They molt five times at intervals of 4 to 5 days, and a little longer period between 5th molt and time of pupation.

Freshly hatched caterpillars are whitish, about 2 mm. long; head very pale testaceous, with faint blackish dot at cluster of ocelli, and a fainter one in middle of front of each lobe. In addition to these markings, after the first molt, there is a black dot in each lateral lobe of the cervical shield; and tubercles ii of segments 3 and 4 have a black spot at lower margin.

After the second molt, in addition to above markings, the head has the markings of the full-grown caterpillar, but they are faint; and tubercles iii of segments 11 and 12 are black-margined. All of these markings become more conspicuous after third and fourth molts. After the fourth molt the anterior and lateral margins of the cervical shield are somewhat blackened.

Full-grown caterpillar.—(Plate IV, figs. 4, 5). Length 32-35 mm.; dull greenish, with two dorsal whitish lines, also whitish on line of spiracles. Head testaceous, a black spot including ocelli, above this a row of three irregular spots extending to vertex, often connected; a round black spot in middle of each half of face, these with one of the spots on each side of head make a horizonal row of 4; two parallel spots in middle near top of head, as viewed from in front; mandibles black at tip.

Cervical shield black-margined nearly all around, most strongly anteriorly, interrupted in middle anteriorly and posteriorly; two small dots in middle near anterior margin, a pair on each side of median line near the posterior margin; two large black spots in lateral lobe of cervicle shield, the anterior one larger, often connected. The tubercle in front of 1st spiracle has black dorsal margin. The dorsal and supra-spiracular tubercles of segments 3 and 4 have a black spot on their ventral margin, often lacking on dorsal tubercle of segment 4; often the tubercles of the other segments are faintly margined, especially those of segment 12. When ready to pupate the caterpillars are quite yellowish. Pupation takes place in a slight cocoon in the caterpillar's "retreat."

Pupa.—Length 15-19 mm.; light to dark brown according to age. There are two rows of delicate hairs on the back situated where there were tubercles on the caterpillar, another row just above line of spiracles, and a row below spiracles; two rows on each side of ventral median line. Cremaster quite sharply pointed, provided with 8 hooked spines which are fastened into the cocoon; wing-cases extending nearly across 4th segment, antenna- and leg-cases extending about half way across 6th segment of abdomen, free beyond 4th segment; spiracles slightly raised. Pupal period 11-13 days.

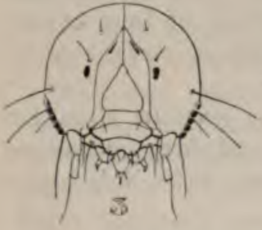
*Omiodes meyricki* n. sp.

♂ ♀. 30-35 mm. Head, thorax and abdomen dull ferruginous; scales of patagia with fuscous tips, apical margins of abdominal segments whitish-ochreous. Palpi fusco-ferruginous, lower half white. Fore wings suffused with ferruginous, veins ochreous-whitish; first line ochreous-whitish, acutely angulated outwards in the middle, posteriorly magined with dark fuscous; an ochreous-whitish transverse discal spot; second line orchreous-whitish, sinuate outwards beneath costa, below middle forming an acute triangular projection outwards, anteriorly usually margined with dark fuscous, sometimes posteriorly followed by broad dark fuscous suffusion between the veins, sometimes none of this suffusion, especially in the males; a terminal row of dark fuscous spots between the veins, cilia pale fuscous, darker at base. Hind wings medium fuscous, veins pale, an indistinct darker discal spot; a whitish-fuscous postmedian line with an acute projection outwardly in the middle, anteriorly broadly margined with dark fuscous ; a terminal row of dark fuscous spots between the veins, preceding this a pale fuscous streak ; cilia whitish, dark fuscous at base.

Very closely allied to *O. blackburni*. The pattern of the wings is the same ; but this species is in general distinctly ferruginous colored, and the sexes are only slightly different ; often the markings of the wings of males are less distinct than those of the females. The males of *blackburni* have a suffusion of dark fuscous in fore wings, whereas the males of this species have a suffusion of ferruginous in fore wings. The hind wings of this species in both sexes are darker fuscous than those of *blackburni*, and the postmedian line is distinctly nearer the termen.

I take pleasure in dedicating this species to Mr. E. Meyrick, whose valuable work on the Lepidoptera of the Hawaiian Islands, in Fauna Hawaiiensis, is indispensable to a student of the Macrolepidoptera of these islands.

Quite a series of both sexes of this moth, I reared from caterpillars collected at Honomu, Hawaii. Several broods of them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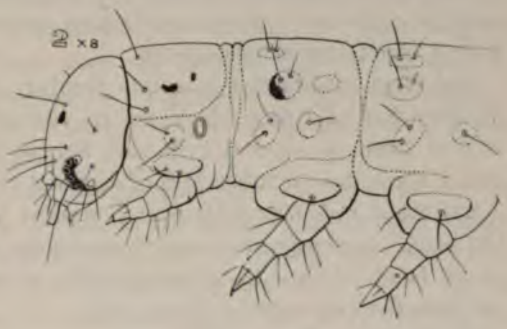
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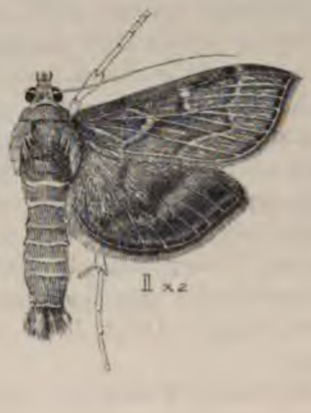
*Omiodes meyricki*

Fig. 1.—Adult male.
" 2.—Lateral view of head and anterior segments of caterpillar.
" 3.—Front view of head of caterpillar.

(This moth was discovered after the plates for the Bulletin were made).


1 ×2

were feeding gregariously on leaves of some wild banana plants, at the side of a gulch near the upper part of the sugar plantation, at an elevation of about 1500 feet. I also collected several clusters of their eggs from which I reared to maturity the caterpillars that hatched. These eggs were nearly all parasitized, however, by the tiny yellow Chalcid fly (*Tricogramma pretiosa*). The parasitized ones being black, and the adult parasites emerged from them in a few days.

### Life History

The eggs are deposited in clusters on the under suface of banana leaves. The number per cluster, in those I collected, was respectively 30, 40, 52 and 60. They are quite similar to other *Omiodes* eggs, but less flat, and the clusters are put directly on the surface, not in a groove or some such place as is customary with *O. accepta* and *O. blackburni*, nor are they arranged in such regular rows.

The freshly-hatched caterpillars are about 2 mm. in length; very pale greenish; head not black as are those of *O. accepta*, but with a black spot at eye-cluster.

2nd Stage.—About 4-5 mm.; similar to previous stage with the addition of a tiny black dot in the middle of front of each lobe of head, a black dot in each lateral lobe of cervical shield, and a black dot on tubercle ii of segment 3.

3rd Stage.—About 8-10 mm.; similar to previous stage, but the black markings are more conspicuous, and there are also two short, faint, oblique lines near middle of head and a little higher up than the two round spots in front.

4th Stage.—About 12-15 mm.; very pale bluish-green; the white fat bodies show plainly thru the transparent skin along each side of the dorsal vessel; head concolorous with the body, with black markings as in previous stage, but still more conspicuous (in some caterpillars, in addition to these markings, there are two transverse oval spots, one on each side of head on top); cervical shield with a tiny dot behind the black spot in each lateral lobe, two tiny dots near middle in front; tubercle ii of segment 3 very strongly black-marked in front and below; no other tubercles have black markings.

5th Stage.—About 18-24 mm.; markings similar to previous stage.

6th Stage.—Full-grown caterpillar about 32-35 mm.; light green, body-wall quite transparent so that the numerous fat bodies show thru and give a good deal of whitish appearance, especially along the sides of the dorsal vessel; head uniform pale greenish, a roundish black spot in each lobe in front, two short oblique lines near middle a little higher than these, none of the caterpillars have the two oval spots on top of head which some had in two previous stages; ocelli dark brown; cervical shield has a black spot in each lateral lobe, a faint dot behind each, two faint dots near middle in front, lateral lobes not at all black-margined; a black spot on lower anterior part of tubercle ii of segment 3; no markings on the tubercles of the other segments. Altho this moth is most similar to *O. blackburni*, its caterpillars are very differently marked from those of the latter, tho both have similar feeding habits—these being the only two species among those whose caterpillars are known, which are especially gregarious tho those of *O. monogramma* are gregarious to some extent. The head and tubercles of *blackburni* caterpillars have numerous black markings, while in this species the caterpillars have very few markings—perhaps fewer than any other species; in this they are very similar to the caterpillars of *accepta*, tho somewhat larger.

The pupa is about 14-17 mm.; similar to the pupa of *O. blackburni*, but a little smaller.

The young caterpillars feed gregariously on the under surface of a banana leaf along the side of the midrib. They spin a slight web for mutual protection, being covered by this and their excrement which is caught and retained by the web. They eat the lower epidermis and the parenchyma of the leaf, leaving the upper epidermis, making it look like dead spots in the leaf where they have fed. When about half-grown, they eat the whole substance of the leaf making a ragged appearance; and they become more separated and roll up the edge of the leaf for a "retreat." They molt five times at intervals of about three days, and about 7–10 days between the 5th molt and the time of pupation, which gives about 22–25 days for the length of the caterpillar stage. The pupa is formed inside a slight cocoon, made in the "retreat" of the caterpillar, or some other convenient place for seclusion and shelter. The pupal period is about 11 days.

*Omiodes monogona* Meyr. Bean Leaf-roller (Plate II, fig. 11).

"♂ ♀, 26 mm. Head, palpi, antennae, and thorax fuscous, palpi white towards base beneath. Abdomen fuscous; segmental margins slenderly whitish. Legs ochreous-whitish, anterior pair infuscated. Fore wings elongate-triangular, costa arched posteriorly, apex obtuse, hind margin rather obliquely rounded; fuscous, irrorated with darker; a dark fuscous line from one-fourth of costa to one-third of inner margin, bent outwards in middle, preceded by some whitish scales; a blackish dot in disc at two-fifths, and a transverse-linear blackish mark beyond middle; a cloudy whitish line from two-thirds of costa to three-fifths of inner margin, thickest beneath, anteriorly suffusedly margined with dark fuscous, moderately curved outwards, below middle with an obtuse subtriangular projection inwards to below discal mark; a hind-marginal row of cloudy blackish-fuscous dots; cilia fuscous-whitish, with a fuscous line (imperfect). Hind wings fuscous; a dark fuscous transverse discal mark at one-third; a cloudy whitish almost straight line from three-fifths of costa to anal angle, anteriorly suffusedly margined with dark fuscous, and posteriorly followed by a broader dark suffusion; an interrupted blackish-fuscous hind-marginal line; cilia as in fore wings." [Meyrick, Trans. Ent. Soc. London, p. 216, 1888].

This species is common on Kauai, Oahu, Maui and Hawaii. The caterpillars feed upon *Erythrina monosperma* ("Wiliwili"), *Dolichos lablab*, and several species of wild beans with long twining vines in the woods of the mountains. I have also found them on garden beans in Honolulu. They fold over (or under) a portion of leaflet, and fasten with silk, or fasten two leaves together where their surfaces are in contact, and feed within, eating away the substance of the leaf and leaving the outer epidermis. Pupation takes place where the caterpillars have fed.

Caterpillar.—(Plate IV, figs. 6, 7). Length about 22 mm.; dark green, due to the contents of the alimentary tract, light yellowish green when the latter does not contain green plant substance. The head has the usual two large roundish black spots on the face, from each of these usually a black band extends obliquely to the periphery, beneath this and parallel to it is a shorter black band, not reaching the periphery; a black band extends from ocelli around the periphery, more or less interrupted on the vertex; two parallel short black bands in the middle of upper part of face; two dots a little above the clypeus, and a little higher are two very tiny dots; a tiny dot at postero-ventral angle of head; antennae black-tipped. Cervical shield more or less completely and strongly black-margined, interrupted at middle posteriorly, in front broken into 8 or 10 dots; a few tiny dots near middle and a little in front of posterior margin; a longitudinal black bar in each lateral lobe, sometimes divided into two spots. Tubercles of all segments more or less black-margined, those of segment 3 usually most strongly margined, those of segments 4, 11 and 12 nearly as strongly margined. In younger stages the head has fewer markings, and the supra-spiracular lines of tubercles are entirely black.

Pupa.—Length 9 mm., medium brown, similar to *O. accepta*. Pupal period 11–13 days.

### *Omiodes epicentra* Meyr.

" ♂ ♀. 25-26 mm. Head, thorax, and abdomen whitish-ochreous mixed with brownish, segmental margins narrowly whitish, anal tuft mixed with dark fuscous. Palpi dark fuscous, lower half white. Forewings moderate, termen bowed; pale ochreous, irregularly mixed with whitish and sprinkled with dark fuscous; veins indistinctly whitish; first line dark fuscous, very acutely angulated in middle, upper portion indistinct, lower strongly marked and followed by a brownish-ochreous suffusion; a blackish orbicular dot; two dark fuscous discal dots transversely placed, followed by an oblique brownish-ochreous suffusion; second line whitish, edged with dark fuscous, with very slight and obtuse angulation below middle; a terminal series of blackish triangular dots. Hind wings grey, darker-sprinkled; a blackish discal dot; a straight whitish postmedian line, edged anteriorly with dark fuscous, and posteriorly by a cloudy dark fuscous suffusion; an interrupted blackish terminal line." [Meyrick, Fauna, Hawaiiensis, I, Pt. II, p. 203 1899].

This species has been collected quite abundantly in certain seasons, by Dr. Perkins, at Waialua and Waikiki, Oahu; but so far the caterpillars remain undiscovered.

### *Omiodes euryprora* Meyr.

" ♂ ♀. 31-33 mm. Head, thorax, and abdomen fuscous. Palpi dark fuscous, lower half white. Legs dark fuscous, tarsi white. Fore wing long, apex subacute, termen rather strongly sinuate; fuscous, purplish-tinged, irregularly sprinkled with whitish, a sharply-defined blackish-fuscous very broad median band, not reaching costa, anteriorly edged by lower portion of faintly marked angulated first line, anterior half of upper edge excavated, with a blackish orbicular dot in middle of excavation, posterior edge margined by whitish second line, forming a strong obtuse prominence in middle; a terminal series of blackish-fuscous dots. Hindwings fuscous, darker posteriorly; an obscure paler postmedian line, angulated in middle." [Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 202, 1899].

A very rare species. Dr. Perkins collected a few specimens at Hilo and Olaa, Hawaii. The caterpillars are unknown.

### *Omiodes telegrapha* Meyr.

"♂. 40 mm. Head and thorax ochreous-yellowish. Palpi yellow-brownish, lower half whitish. Fore wings long, termen sinuate beneath subacute apex; light ochreous-yellowish, slightly blackish-sprinkled, veins partially white; first line very acutely angulated above middle, only indicated by several blackish dots between veins; second line cloudy, blackish, interrupted by veins, almost straight; an almost terminal series of blackish dots, preceded by white dashes. Hind wings grey, veins whitish; a dark grey discal dot; a straight whitish postmedian line, edged anteriorly narrowly, and posteriorly more broadly with dark grey suffusion; a terminal series of black dots preceded by white dashes." [Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 204, 1899].

The only specimen known was collected by Dr. Perkins, at Olaa, Hawaii. The caterpillars are unknown.

### *Hymenia recurvalis* (Fabr.) (Plate II, fig. 12).

♂ ♀ 20–23 mm. Head pale lemon yellow, eyes and antennae brown; palpi pale lemon yellow, third joint and apical portion of second, in front, brown; thorax and abdomen fulvous brown, apical margins of abdominal segments ringed with white, that of 2nd abdominal segment much fainter than the others, that of 1st segment yellowish. Legs brownish white, middle tibiae pale yellowish on outside, anterior tarsi ringed with blackish. Forewings fulvous brown; a medial white band pointed in front but not reaching costa, outer edge irregular and toothed on vein 2; second line represented by a white band from costa to vein 5, a row of three white spots extending dorsally from the outer terminal angle of this band, situated between the veins 2 to 5 (sometimes that between veins 2 and 3 absent); cilia brown, darker at base, two white

**spots one at vein 5 the other near anal angle. Hindwings fulvous brown, with oblique white medial band not quite reaching costa, and terminating near anal angle, narrowing at the dorsal part, this band as well as those of forewings are blackish bordered. that of the hindwing most distinctly; cilia white, dark brown at base, except a spot between veins 5 and 6, which is white to the base.**

This species is closely related to our *Omiodes* species. It is a widely distributed species, occurring in Asia, Africa, and Australia. It is very abundant in the Hawaiian Islands. The caterpillars feed chiefly upon Pigweeds (one or more species of Euxolus, and *Portulaca oleracea*), often being so abundant as to entirely strip the leaves from these common weeds over large areas. They also feed upon garden beets, cockscomb, and other cultivated and wild plants or weeds of the Amarantaceae and Chenopodiaceae. The caterpillars feed on the under-side of the leaves protected by a slight web; being green, they are easily hidden, somewhat resembling ribs of the leaf. The moths are often so numerous in cane-fields where the above mentioned weeds are abundant, that they may be mistaken for cane leaf rollers, or other injurious moths.

### Life History

The eggs are flattish oval about ⅔ mm. by ½ mm.; finely reticulated and somewhat wrinkled and of an iridescent greenish hue. They are deposited singly on the surface of a leaf, usually beside a rib or vein, or in a groove produced by a vein on upper surface of a leaf. They hatch in a few days, and the caterpillars are full grown in about two weeks.

Caterpillar.—(Plate IV, figs. 9, 10). Full-grown, 19 mm. long, tapering towards the ends, the head quite narrow compared with the middle of body; light green, turning rose-colored a day or two before spinning cocoon. The head has some faint brownish mottling, black ocelli, a tiny black dot on postero-ventral angle; cervical shield has faintly black lateral margin, a conspicuous black spot in each lateral lobe, a tiny dot behind each spot, anterior part of lateral lobe has brownish mottling similar to that on the head; two black spots on segment 3 larger than those of cervical shield, these are tubercles ii. The tubercles are arranged similarly but they are not so conspicuous as in *Omiodes*.

The pupa (Plate IV, fig. 11) is formed within a slight cocoon in folded together piece of leaf. It is very pale brown, 10 mm.; wing- and antenna-cases reaching to posterior margin of 4th abdominal segment; spiracles of 4th abdominal segment slightly larger and surrounded by a swollen ring; cremaster short, with 8 long hooked spines fastened into the cocoon. Pupal period about 12 days.

### * Table of species of *Omiodes*.

| | | |
|---|---|---|
| 1 | Forewings with veins marked by pale lines | 2 |
| | " " " not marked by pale lines | 6 |
| 2 | Second line with acute projection outwards | 3 |
| | " " without " " " | 4 |
| 3 | Forewings of male suffused with ferruginous | *meyricki* |
| | " " " not " " " | *blackburni* |
| 4 | First line indicated by dark shade | 5 |
| | " " " by dark dots only | *telegrapha* |
| 5 | Second line very obtusely angulated below middle | *epicentra* |
| | " " not angulated | *accepta* |
| 6 | Forewings ochreous or ferruginous | 7 |
| | " fuscous | 8 |
| 7 | Orbicular and discal spots well-marked | *demaratalis* |
| | " " " absent | *monogramma* |
| 8 | Hindwings with postmedian line angulated or bent in middle | 9 |
| | Hindwings with postmedian line almost straight | 11 |
| 9 | Median band of forewings darker | 10 |
| | " " " not darker | *localis* |
| 10 | Forewings with second line obsolete | *asaphombra* |
| | " " " sharply marked | *euryprora* |
| 11 | Postmedian line of hindwings white | 12 |
| | " " " not white | 13 |
| 12 | Second line of forewings projecting inwards below middle | *monogona* |
| | Second line of forewings without projection | *continuatalis* |
| 13 | First line followed by blackish streak | 14 |
| | " not so followed | *iridias* |

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*Adapted from Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 201, 1899.

14 Blackish streak following first line, bent nearly at right angles .................................. *anastrepta*
Blackish streak following first line, bent at very obtuse angle ........ ..................... .......... *antidoxa*

## Table for the Determination of the present known Caterpillars of the Genus *Omiodes* in Hawaii.
(Foodplants given in parenthesis).

1 (14) Each lobe of head with a roundish black spot near middle in front, a black spot including most of the eye-cluster; no other conspicuous spots on head.
2 (3) Lateral lobes of cervical shield not black-margined.
2a. Head yellowish, checkered with darker yellow (Sugar cane and grasses) ......................... *accepta*
2b. Head pale green, not checkered (Banana)... *meyricki*
3 (2) Lateral lobes of cervical shield more or less black-margined.
4 (9) Tubercles of segments 5-11 not wholly or partially black-margined.
5 (6) Supra-spiracular tubercles of segment 12 black-margined only on upper and posterior sides, especially strongly marked posteriorly (Grasses).........,. *localis*
6 (5) Supra-spiracular tubercles of segment 12 margined nearly all around, not strongly marked posteriorly.
7 (8) Tubercles ii of segment 3 strongly black-margined all around, except on upper side (*Astelia veratroides*) ......................................... *iridias*
8 (7) Tubercles ii of segment 3 strongly marked only in front and below (*Astelia veratroides* silversword) ................. ................. *asaphombra*
9 (4) Some of the tubercles of all segments more or less black-margined.
10 (11) Cervical shield not black-margined posteriorly (Grasses, especially "pili" grass) ....... *continuatalis*
11 (10) Cervical shield conspicuously black-margined posteriorly.
12 (13) Tubercles of segments 5–10 only partially blackened on margins (Grasses).................. *demaratalis.*

13 (12) Tubercles of segments 5–10 almost completely black-margined *(Dianella odorata)*.......... ***monogramma.***

14 (1) Besides above mentioned spots, 4 or 5 other black spots on each lobe of the head.

15 (18) Lateral lobes of cervical shield not black-margined.

16 (17) Tubercle i of segment 3 very strongly black-marked anteriorly (Sedge: *Carex oahuensis)*...... ***anastrepta.***

17 (16) Tubercle i of segment 3 not strongly black-marked (Sedge: *Rhyncospora thyrsoidea)*.......... ***antidoxa.***

18 (15) Lateral lobes of cervical shield strongly black-margined.

19 (20) The black eyespot has a considerable extension upward on side of head (Bean vines and "wiliwili" tree) .................................. ***monogona.***

20 (19) No extension of the black eyespot upward on the side of head (Palms, especially coconut, and banana) .................................. ***blackburni.***

## REMEDIES.

Arsenical sprays such as Paris Green and Arsenate of Lead should be more or less effective against leaf-rollers when they become destructive. There would be great difficulty in applying these in cane fields, however, except in young fields where the cane has but a few months' growth, and small enough not to be broken down by a spraying cart. Of course it is in the younger cane the destruction by leaf-rollers will be greatest, as the amount of eating they would do on small shoots has greater effect in crippling it for further growth. Larger cane is better able to withstand some loss of leaves without any particular injury.

So far as I know, no trials have been made to determine how expensive, or how effective, the use of poisons may be in the control of this pest. At present, the natural enemies have made the damage by leaf-rollers less severe than in former years, as indicated by occasional reports of very serious injury by them in the past. But even with this usually efficient control by parasites, there may be times when certain fields of young cane appear to be becoming too seriously attacked by leaf-rollers, and spraying could be profitably resorted to. In case this is attempted, a cart should be devised to be drawn by a team, and straddling one row, spray it and another row on either side. This might be readily done in unirrigated fields, but probably too difficult to accomplish in irrigated fields, on account of the crookedness of the rows of cane in conforming to the natural contour lines of the land.

Arsenate of lead would be the better poison to use, as it is easier retained in suspension in the water of the spraying cart; and it also adheres to the leaves permanently, even in rainy times; whereas Paris Green would wash off with the first shower. About 4lbs. of the Asenate to 100 gallons of water would be a good proportion to use. This should be effective against the Army worm and cut worms as well. They sometimes infest the fields of young cane at the same time the leaf-rollers do, though usually they are apt to be injurious to young cane at an earlier stage than it is attacked by the leaf-rollers.

A method which has been used at times is to go over the field row by row, and by hand, pinching all the "retreats" of the leaf-rollers that can be seen, thus destroying the caterpillar within. This could be accomplished without much additional labor at the time of hoeing, the laborers being properly instructed to look for the "retreats" which are usually conspicuous, when one knows what to look for, i. e., the portion of margin or tip of leaf rolled up into a tube on a portion of the leaf which has been more or less eaten away by the caterpillars.

Young palm trees may be easily relieved of the leaf-roller pest by frequent examination, and destroying the young caterpillars soon after they hatch, when they are feeding gregariously on the the surface of the leaf. The colony may be recognized by the web by which they are covered; and a stiff brush, or something similar, may be used to kill them at one stroke. After they have grown to a larger size and fastened together leaflets or folds of the leaf for hiding places, they may be killed by pinching together the folds with the fingers, continuing the pressure along the whole length of the fold of the leaf or leaflet. This is applicable to small trees only; after they have grown larger, beyond convenient access, nothing can be done to advantage. Spraying with poison is not feasible, as the caterpillars do so much of their feeding inside of folded leaves that the poison is not likely to be placed where much of it will be eaten by them. Under these circumstances dependence has to be made upon the natural enemies, of which there are many. Of course it will be readily understood, that any method given above for the destruction of leaf-rollers, will also result in the destruction of whatever parasites may be infesting them at the time.

## NATURAL ENEMIES.

Omiodes caterpillars are attacked by a large number of species of parasites, some of which are native, and several which are the most valuable have been introduced. The most of the species are kept in check by their natural enemies, so that they do not become very numerous; in fact, several of them are very rare. Two species feed so numerously on cultivated plants that they become serious pests: *accepta* on sugar cane, and ***blackburni*** on palms. These two species are preyed upon very extensively by the parasites and checked considerably, but not sufficiently to keep them from doing considerable injury in certain localities and at certain seasons. Apparently the moths are more prolific in the winter months (about December to March), and the parasites are scarcer owing to their having had fewer caterpillars for them to keep breeding on during the preceding summer. Hence, when the winter broods of caterpillars appear, there may be two or three generations of them before the parasites breed up to sufficient numbers so that they produce any noticeable check on the number of the caterpillars; then in another generation or two the caterpillars may be much reduced in numbers and a large percentage of them found to be parasitized; for example: on one occasion 75% of the cane leaf-rollers in a field at Hutchinson plantation, Hawaii, were found to be destroyed by one species of parasite; at Olaa plantation, Hawaii, in a certain field, on one occasion a much higher percentage of them than that were killed; in Honolulu, of a large number of the palm leaf-roller caterpillars collected, 90% were parasitized.

Since there are so many species of parasites preying on the leaf-rollers which are pests, it might be asked "Why do they not become exterminated, or at least cease to be pests?" Apparently, with all of the parasites, they are still not numerous enough to over-balance the prolificness of the pest, even tho they do kill such high percentages of them at times. Since so many are killed by parasites, and yet there are enough left to do considerable injury at times, one can not help but wonder to what extent these pests might increase were there no parasites preying on them, and how many times more serious would be the damage done by them. The extreme difficulty and impracticability of treating sugar cane fields, or large palm trees, artifically, for the destruction of these pests, makes it all the more important that there are so many valuable parasites preying upon them; and shows the value of introducing natural enemies to control a pest, for the four best parasites of these leaf-rollers are introduced species, viz., *Macrodyctium omiodivorum*, *Chalcis obscurata*, *Frontina archippivora* and *Trichogramma pretiosa*.

*Macrodyctium omiodivorum* n. sp.* Omiodes Braconid (Plate V, fig. 1).

" Female:—Length 2-3.5 mm.; pale ochraceous with blackish areas, head and thorax often darker, rather pubescent. Head transverse, pale ochraceous; ocelli enclosed in a black area, which sometimes extends forward to the bases of the antennae; occipital area black. Antennae about equal in length to the entire insect, dark fuscous, paler at base, the scape sub-globose, not larger than the first joint of the flagellum, pedicel about as long as thick; number of joints variable, 26-28. Thorax finely punctate, pubescent, ferrugino-ochraceous or blackish, discal area often with a median blackish area produced to the thoracic foramen; parapsidal furrows not very distinct, very slightly convergent posteriorly. Meso- and metapleura ferruginous or blackish; metanotum, pre-scutellar suture, posterior margin of scutellum, post-scutellum and humeri blackish or even pitchy.

Abdomen ovate, rather convex, pale ochraceous; first segment trapezoidal, deeply impressed, raised laterally, with a median blackish area; the remaining segments smooth, except the second which has a small median tubercle basally, which is infuscate; each of the third, fourth and fifth segments has a median dark fuscous or blackish patch, the whole forming a large sub-quadrate area on the dorsum. Terebral sheaths short, less than one half the length of the abdomen, dark fuscous, pubescent. Legs moderately stout, pubescent, unicolorous, pale ochraceous, except the apex of the terminal tarsal joint and claws which are blackish; tibial spurs not large. Wings smoky, veins, costa and stigma dark fuscous; second abscissa much larger than the first and distinctly larger than the first transverse cubitus.

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* Description by F. W. Terry.

Male:—Very similar to the female though usually rather smaller and darker, the blackish areas more generally distributed over the head and thorax. Usually the ochraceous coloring becomes more ferruginous with the melanic forms of both sexes.

The above species agrees generally with Ashmead's ***Macrodyctium***, although approaching *Myosoma* in the character of the pedicel.''

This valuable Braconid is an introduced species. There is no definite record of it, but it was probably introduced by Mr. Koebele from Japan, in 1895, at the same time that he introduced *Chalcis obscurata*. It is now thoroughly established and very widely distributed in these islands. It is the most valuable of all the parasites on the cane leaf-roller (*Omiodes accepta*), and is found wherever the latter is abundant in the cane-fields.

In one field of Hutchinson Sugar Plantation, Kau, Hawaii, where there were a good many *O. accepta* caterpillars feeding on the cane leaves, a large number of the caterpillars were examined and by actual count 75% were dead, having been killed by this parasite. Many of the caterpillars had the larvae of the parasite feeding upon them; others were entirely dried up, the parasites having obtained their growth and spun cocoons in a cluster on the leaf close by. In a cane-field at Olaa, Hawaii, I found the leaf-rollers, tho abundant, nearly all killed by this parasite. Similar conditions I have found in many other sugar plantations. The larvae are entirely external feeders, and grow very rapidly, becoming full-grown before the caterpillar gets too much decomposed. I have found this parasite feeding very abundantly on a leaf-roller (*Cacoecia*, sp.) on Guava, at Kipahulu, Maui, and on the palm leaf-roller (*Omiodes blackburni*) in Honolulu. It probably will eventually parasitize many other species of leaf-rollers, attacking particularly whichever is most abundant in the paticular locality.

### Life History

The female parasite most likely attacks the *Omiodes* larva within its "retreat," made of a piece of leaf rolled over. From the size of her ovipositor, one would expect that she would insert her eggs within the host; but so far as I have observed they are placed on the outside, (Plate V, fig. 2). The number of eggs varies. I have seen 5 on one caterpillar; and the number of larvae which I have seen feeding upon one caterpillar varies from 1 to 23—probably all laid by the same female.

The adult parasite must sting the host caterpillar before laying its eggs, for the caterpillars have the habit of squirming very actively when disturbed, and falling to the ground.

The caterpillars always appear to be dead whenever found with parasites or their eggs, but probably they are only paralyzed by the sting of the parasite, as is done by certain wasps which store up caterpillars and spiders for food for their larvae. Often on examination of these apparently dead caterpillars which have parasite eggs or small larvae present, pulsations can be seen in the dorsal vessel.

The eggs are white, or slightly yellowish, ⅝ mm. long. They hatch in a day or two, and the young larvae have a very rapid development. They are footless grubs, and feed externally (Plate V, fig. 3), biting into the caterpillar and consuming its juices. In one instance under observation, they had become full-grown (4 mm.) in three days, and begun spinning cocoons; cocoons were finished the next day; three days after, the pupae were formed; and after five more days the adults appeared. This gives the life cycle as 13 to 14 days. From this same lot another generation was bred to maturity in exactly 14 days.

The cocoons (Plate V, fig. 4) are made in a cluster on the surface of the cane leaf close by the dried up remains of the dead caterpillar. The pupa is whitish at first, but becomes black in a few days, before the adult is formed. The adults emerge by eating a round hole near one end of the cocoon.

### Hyperparasite. (*Eurytoma* sp.)

In Dec., 1905, I bred 9 of this Chalcid from a cluster of *Macrodyctium* cocoons. This cluster of 10 cocoons was collected at Naalehu, Hawaii, on a sugar cane leaf where a cane leaf-roller had lived before being attacked by the parasite. After 16 days, 9 adults (7 females and 2 males) of this hyperparasite emerged—one per *Macrodyctium* cocoon. Dissection of the 10th cocoon, disclosed a dead adult *Macrodyctium*. I have collected this Chalcid from cane-fields in Hamakua, Hawaii; and in April, 1907, I bred quite a number from cocoons of *Macrodyctium*, collected from palm trees in Honolulu, where the larvae of *Macro-*

*dyctium* had been feeding upon the caterpillars of the palm leaf-roller. It is very probable that this Chalcid has a general distribution thruout the islands tho perhaps not generally abundant. It will be unfortunate if it increases in number so as to diminish the effectiveness of *Macrodyctium* on the cane leaf-roller, and palm leaf-roller.

*Chelonus blackburni* Cameron (Plate VI, fig. 1).

"♀. Length 2.4 to 2.5 mm. Black, half shining, covered with a close microscopic silky pubescence; the greater part of the scape of the antennae and the four folowing joints reddish testaceous; extreme apex of coxae, trochanters, apex and base of anterior femora, and the posterior knees, pale red; four anterior tibiae and tarsi pallid testaceous; hinder tibiae broadly annulated with white, the white ring being nearer the top than the bottom; tips of four anterior tarsi and the hinder pair fuscous; the greater part of the hinder metatarsus white; spurs white; basal third of abdomen white, except a blackish mark at extreme base; at the apex this white portion is rounded, and at its junction with the black colour passes into brown. Mandibles reddish. Antennae about the length of the body, 17-jointed, the seven apical joints thicker than the basal ones. Head finely punctured, the face covered with white hair. Mesonotum finely punctured. From the usual transverse ridge at the base of the scutellum there runs a central straight carina, and outside of this again are two curved outwardly, but it is only the second which reaches the edge of the thorax; these keels are united by fine cross-bars. Scutellum smooth, shining on basal half, apical half with longitudinal striations. Metathorax punctured, and with distinct coarse longitudinal striations, truncated at the apex, and with a minute tooth at each edge. Abdomen about the length of head and thorax, finely punctured, the punctures almost obsolete on the basal white portion. The second segment depressed in the centre, and produced at the sides into a leaf-like ridge, from the inner side of which runs an almost obsolete carina in the direction of the centre of the segment, but which is not reached. The union (apparent) of the second with the third segment is indicated by a fine transverse line. Wings hyaline, stigma, radial and cubital nervures fuscous; other nervures pale testaceous." [Ashmead, Fauna Hawaiiensis, I, Pt. III, p. 359, 1901.]

This little Braconid is common in the Hawaiian Islands. Altho described from here, it also occurs in Australia, (Perkins). It is probably parasitic on a number of species of leaf-roller caterpillars; but I have bred it only from the caterpillars of *Hymenia recurvalis*, on which it is quite common, a few from *Homoeosoma humeralis*, and the tobacco split-worm (*Phthorimaea operculella*). Of a lot of the former caterpillars collected in Honolulu for rearing, parasites bred out from 14%. Dr. Perkins has also bred this parasite from *Phlyctaenia despecta*.

The parasitized caterpillar spins its cocoon when only about half grown (tho it may be the same age as a normal full-grown unparasitized one), but it does not pupate. In a day or two the half grown larva of the parasite emerges from the caterpillar and feeds upon it externally, finishing it in a day or two (Plate VI, figs. 1a-d). When full grown it is a thick, yellowish-white grub about 5 mm. long, somewhat tapering towards the anterior end, which is curved ventrally. It spins a delicate white cocoon inside the host's cocoon. The pupa is about 3 mm. long, whitish, with brown eyes. Before changing to adult stage it turns black, except the base and venter of abdomen. They are adult in about 2 weeks from the time the host caterpillar spun its cocoon.

### *Echthromorpha maculipennis* Holmgren. (Plate V, fig. 6).

"♀. Length 12 to 16 mm.; ovipositor about half the length of the abdomen, or a little less. Black, punctate, the abdomen, except the first segment which is smooth and shining, closer and more strongly punctate, the scutellum convexly elevated, nearly smooth, the post-scutellum smooth, impunctate, but with two foveolae, the posterior face of the metathorax polished, impunctate, but with some faint, transverse aciculations towards sides, towards the base and the pleura strongly punctate. Mandibles toward base and the anterior femora beneath and toward apex, their tibiae and tips of tarsal joints rufous; rest of legs black. The head is transverse, thin antero-posteriorly, the temples being flat, not developed, the face above the insertion of the antennae concave, the basin being smooth, except some faint aciculations or wrinkles; below the antennae the face is feeble convex, sparsely punctate but shining; the clypeus is large, smooth, the labrum slightly exposed, yellowish; palpi yellowish; ocelli pale. The wings are hyaline, with a small black spot almost at the extreme apex of the front wings, the stigma and veins black, except the longitudinal veins at their origin, which are testaceous. The abdomen is similar to that in *Pimpla* (sens. str.), the dorsal segments 2 to 6 with a transverse impressed line at apex, which is more or less obsolete medially, and with segments 2 to 5 also with an oblique line on each side extending from the base to the apical transverse line, the apical portion of the segments beyond this line being smooth.

The three basal areolae of metanotum are less strongly punctured than the rest; the superior median areola small, distinct, semicircular, broader than long; posterior median triangular at base; from that it contracts slightly and ends above the middle of the metanotum, where there is another field longer and somewhat oval in form, which occupies the rest of the middle space; the posterior intermedian area is semiobsolete, small; spiracular, large, wider at base than at apex; at the base it becomes rounded and enlarged. Wings hyaline; areolet shortly stalked; stigma fuscous." [Ashmead, Fauna Hawaiiensis, I, Pt. III, p. 357, 1901.]

In a series of 25 females and 43 males which I have examined, I am unable to distinguish, by Cameron's descriptions and tables, which are *hawaiiense*, and which are *blackburni*, or whether they are all the same species. None of them agree completely with either description; tho I can separate some of them by the distinctions he gives in the markings of the legs, yet I have variations between, and my specimens do not have corresponding differences in pubescence; whereas Cameron makes a difference in pubescence a strong point of distinction between the two species. His descriptions are from a single female in each case, which, from the variations in my series of specimens, I think very inadequate for definite descriptions of species; in fact, he himself says, "I am not sure that if we had a long series of each, it would be found that they were varieties of one species." If they are to be considered as one species, the name *L. blackburni* Cameron, being the earlier described, should have preference.

I have bred this native Ophionid parasite from several species of leaf-rollers: cane leaf-roller (*Omiodes accepta*), palm leaf-roller (*O. blackburni*), "Wiliwili" leaf-roller (*O. monogona*), *O. localis*, *Pyrausta constricta*, *Homoeosoma humeralis* and from two undetermined species of *Phlyctaenia*. I also bred quite a large series from the tobacco splitworm (*Phthorimaea operculella*) which was badly infesting tomato vines and fruit. Dr. Perkins has bred them also from *Cacoecia*, *Phlyctaenia despecta* and *P. stellata*. Probably many other species of the smaller Pyralids are parasitized by them. I have collected specimens in several districts of Hawaii, in Iao Valley, in Honolulu, and in the mountains near Honolulu. The larva of this parasite eventually kills the host caterpillar, when the latter has become about full-grown. It emerges and spins a compact, light brown, oblong cocoon on the leaf beside the remains of its host, within the rolled together leaf which the caterpillar had for a hiding-place. The cocoon is of two layers; the outer one is slight, of brownish silk and closely encloses the inner one, which is strong and papery and blackish in color.

### *Sierola dichroma* P., MSS.

This native Bethylid I have bred from a caterpillar of *Omiodes asaphombra*, in the mountains above Palolo, Oahu. The larvae feed on the exterior of the caterpillar which has been stung and paralyzed by the adult parasite. They grow rapidly, and having finished, spin cocoons in a mass near the remains of the caterpillar. In the instance above mentioned, 9 larvae fed upon one caterpillar, and they spun their cocoons obliquely side by side in a mass. They were light brown and the individual cocoons did not show conspicuously from the exterior of the mass.

There are several species of *Sierola* in the Hawaiian Islands. They are all probably parasitic on caterpillars. What appears to be *S. molokaiensis* I have bred from a species of Cacoeciid caterpillar which feeds on a native tree, *Myrsine*. Mr. Perkins has bred a species from a Tineid caterpillar which is related to the "bud worm" in sugar cane. I have taken a species of *Sierola* in the sugar cane of the Experiment Station grounds, under circumstances which indicated that it was parasite of the sugar cane "bud worm."

### *Chalcis obsurata* Walker.

"Body, antennae and legs black, with the usual structure. Body convex. Head and thorax scabrous, dull. Antennae stout, nearly filiform. Prothorax about four times as broad as long. Sutures of the parapsides distinct. Abdomen smooth, shining, subsessile, with cinereous tomentum towards the tip. Femora yellow at the tips, hind femora minutely denticulate beneath. Tibiae yellow beneath, striped beneath with black; hind tibiae black at the base. Tarsi yellow, tips black. Wings cinereous; squamulae yellow; veins black; ulna about as long as the humerus, (Walker)." [Ashmead, Fauna Hawaiiensis, I, Pt. III, p. 307, 1901.]

This is our largest Chalcid. It was originally described from Japan, and also occurs in China. It was introduced to the

Hawaiian Islands by Mr. Koebele, in 1895, from Japan, and in 1896 from China. It quickly became established, and is now abundant thruout the group. It is a very valuable parasite upon Pyralids and some other moths. I have bred it from the pupae of the following moths, in most cases quite abundantly: sugar cane leaf-roller (*Omiodes accepta*), palm leaf-roller (*O. blackburni*), *Phlyctaenia despecta*, *P. stellata*, *P. nigrescens*, *Cacoecia* (two species), *Plusia chalcites*, Sida tortrix and Koa tortrix. They are always common in sugar cane fields where the cane leaf-rollers are abundant, and render good assistance in checking this pest. They are even more abundant on the palm leaf-roller.

### Life History

This parasite attacks the pupa (perhaps the larva as well sometimes) of its host. I have often found the cocoons of its hosts with a hole gnawed in the enclosing leaf, and a puncture in the enclosed pupa where the parasite has inserted an egg. From these I have subsequently reared the adult parasite. The length of larval stage is as yet undetermined. It pupates inside the host pupa, without forming a cocoon; in about 9 days it emerges as an adult by gnawing a roundish hole usually towards the anterior part of the host pupa. There is great variation in size of adults of this species, depending on what its host has been. Those I have reared from the Sida tortrix were quite minute compared with large ones reared from *Plusia chalcites* and *Omiodes blackburni*, which are much larger hosts. I never have reared more than one from a single pupa, tho some of the larger pupae would furnish food enough for more than one parasite.

*Trichogramma pretiosa*, Riley.

"Length about 0.3 mm. Yellow, the eyes red, the wings hyaline. Head wider than the thorax; antennae 5-jointed, joints 3 and 4 in the ♀ forming an ovate mass and together shorter than joint 2; joint 5 large, thickened and very obliquely truncate; in the ♂ joints 3, 4 and 5 form a more or less distinct, elongate club, beset with long bristles. Hairs of the wings arranged in about fifteen lines. Abdomen not so wide as the thorax, but as long as the head and thorax together; in the ♀ the sides subparallel, apical joint suddenly narrowed to a point." [Riley, Can. Ent. XI, p. 161, 1879.]

This little Chalcid fly is a very valuable egg-parasite, occurring thruout the United States, from Canada to Texas, and from Massachusetts to Colorado. It has been reported as parasitizing very extensively the eggs of many species of moths, including the cotton worm (*Aletia argillacea*), cotton boll-worm (*Heliothis armigera*), zebra caterpillar (*Mamestra picta*), codlin moth (*Cydia pomonella*), and West Indian sugar cane borer (*Diatraea saccharalis*). It no doubt destroys the eggs of many other species as well.

What was undoubtedly this species, Mr. Koebele, in his notes for 1900, mentions as having become established on the eggs of the palm leaf-roller (*O. blackburni*), in Honolulu. Tho I find no record of it, yet he probably had introduced this parasite a year or two previously. It is now widely spread. I have bred it from palm leaf-roller eggs in Honolulu; quite abundantly from eggs of *O. meyricki*, a closely related species, whose caterpillars were feeding on banana leaves at an elevation of about 1500 feet at Honomu, Hawaii; and I have had parasitized eggs of the sugar cane leaf-roller (*Omiodes accepta*) fron Olaa and Kohala, Hawaii. It probably is preying upon the eggs of the cane leaf-roller wherever these are abundant thruout the islands. These eggs are difficult to find, and hence not often seen unless the cane is badly infested with leaf-rollers. On this account so little is definitely known of the distribution of this little parasite. They are so small that usually three of them obtain their full-growth within one *Omiodes* egg. They breed very rapidly, i. e., have a very short life cycle. I bred one generation of them in 10 days; and in the West Indies they have been observed to reach maturity in much less time than that.

To my knowledge, this is the only parasite on the eggs of Lepidoptera in the Hawaiian Islands.

### *Frontina archippivora* (Williston). (Plate VI, fig. 4).

Williston, Scudder's Butterflies of New England, III, pl. LXXXIX, fig. 18, 1889.

I have bred a large number of Tachinid flies of medium size from leaf-rollers and cut-worms and other caterpillars. They appear to be all of the same species, and apparently do not differ from a specimen of *Frontina archippivora* received from Mr. Van Dine, which had been identified for him by Mr. Coquilett of Washington, D. C. Van Dine bred quite a series of these flies from the pupae of cabbage butterfly (*Pieris rapae*); Mr. Terry has also bred them from the same host and from *scotorythra rara*. I have bred a few from *Omiodes accepta*, *Spodoptera exigua* and *S. mauritia*; quite abundantly from the Palm leaf-roller (*Omiodes blackburni*); and large numbers of them from cutworms: *Agrotis crinigera* and *Agrotis dislocata*. In one lot of *Leucania unipuncta* caterpillars collected in sugar cane-fields at Pahala, Hawaii, 27% were parasitized. In a lot of caterpillars of this same "army worm" collected in cane-field at Naalehu, Hawaii, 33 1/3% were parasitized; in another lot collected in cane-field at Hamakuapoko, Maui, 70% were parasitized by this Tachinid. I also bred a lot of caterpillars of the Monarch butterfly (*Anosia plexippus*) which were feeding on wild milk-weed in the pastures at Pahala, Hawaii, and 21% of them were parasitized. I found 28% of the caterpillars of another butterfly (*Vanessa cardui*) collected near Diamond Head, Oahu, to be parasitized by these flies.

From the above it is seen that these flies are very abundant in these islands, and are of valuable service in checking many of the destructive caterpillars. This species is very widely distributed in the United States, where it is parasitic upon quite a large number of species of caterpillars. It was undoubtedly introduced from there, perhaps somewhat recently, but the date is not known.

The eggs of these Tachinid Flies are deposited upon the living caterpillars. They soon hatch and the young maggots enter the body of the caterpillar and feed upon its juices. They usually do not become full-grown until the caterpillar has also obtained its full-growth and ready to pupate; then the full-grown maggots emerge from their dead host and form smooth dark brown, rounded oblong puparia in the ground. When parasitic on the palm leaf-roller, I have often found the puparia formed within the spun-together leaves where the caterpillars lived, in one instance six in a single leaflet of coconut leaf. Sometimes the host does not die till after pupation, and then the maggots soon emerge as from the caterpillar. Apparently the rate of growth of the host caterpillar has something to do with determining whether the parasitic maggots emerge before the pupation of the host or afterward. With the cutworms which are the larger caterpillars and are slower to reach full-growth, the maggots of the parasite become full-grown usually before their host does, and kill and emerge from it before pupation takes place. On the other hand, the smaller species of caterpillars, or those which are of more rapid growth, pupate before the parasitic maggots emerge from them. This is the case with *Pieris rapae* and *Vanessa cardui*. Another explanation may be, that in the case of these latter species, the eggs of the parasite are deposited upon the caterpillars when they are more nearly full-grown, and hence the young maggot has not yet reached a large enough size to interfere with the development of its host when the latter is ready to pupate; so it pupates, but soon thereafter the parasite becomes full-grown, consuming the juices of the pupa in doing so, and breaking an opening in the pupa-case, wriggles out and lets itself slowly down to the ground by a strand of slimy material which it excretes and sloughs off at the posterior end of body by its constant wriggling. One or two is the usual number of maggots per caterpillar; but there are sometimes more. I have obtained as many as five. When there are so many they do not have food enough, and produce stunted, undersized adult specimens.

### *Chaetogaedia monticola* (Bigot).

Grimshaw, Fauna Hawaiiensis, III, Pt. I, p. 20, 1901.

This is a larger Tachinid, occurring thruout the group, usually from the lowlands up to 4,000 feet. It is also reported from California. I have bred it from several species of caterpillars, mostly cut worms, army worms, etc.: *Leucania unipuncta*, *Leucania pyrrhias*, *Agrotis dislocata*, *A. cinctipennis*, *Plusia chalcites*, *Scotorythra rara*, cane leaf-roller (*Omiodes accepa*), *Omiodes continuatalis*, *Phlyctaenia monticolans* and *Hymenia recurvalis*. Dr. Perkins has bred it also from the "Peelua" (*Spodoptera mauritia*) and the Hau moth (*Cosmophila sabulifera*). It has been bred by Mr. Giffard from a black army worm, which has lately appeared in quite large numbers on Tantalus and whose identity is at present unknown. Mr. Kirkaldy reports a pupa of the butterfly *Vanessa cardui* parasitized by this fly. It is thus seen that this is a very valuable fly, as it is very abundant at times on some of the above hosts.

The maggots or larvae of this parasite feed within their living host caterpillars, but do not get their full-growth until after the caterpillar has pupated. I never have found more than one parasite per caterpillar, in this species. It does not escape from its host to form a puparium as the former species does; but forms its puparium within the pupa of its host, after having consumed all the juices of the latter. The puparium of this species differs from that of the former, in being larger, and in having two trilobed black protuberances on the posterior end, which is usually somewhat widened and blunt. The adult fly emerges in about 15 to 20 days after the pupation of its host. In two instances where the host pupa was opened in order to make observations on the maggot of the parasite, it was found that the adult fly emerged in 11 and 14 days, respectively, from the time its puparium was formed.

*Odynerus nigripennis* (Holmgren). (Plate VI, fig. 5.)

"Black, the wings infuscate, and with a blue (but not bright) iridescence. A small median spot behind the antennae, and another behind each eye, often flavous. Apex of clypeus depressed, and lightly emarginate. Mesothorax finely, but very densely rugosely-punctate, the punctures generally rather large in the ♂. Post-scutellum with a very distinct raised line (usually serrulate or spinulose) at the truncation. Propodeum rough with large, feebly impressed, punctures. Abdomen with the second segment not raised from the base; beneath, with a wide depression, but shallow, meeting the apices of the costae obliquely, the costae themselves more or less obsolete or indistinct." [Perkins, Fauna Hawaiiensis, I, Pt. I, p. 70, 1899.]

There are more than 100 species of wasps of the genus *Odynerus* which are peculiar to the Hawaiian Islands. This black species is one of the largest ones. It is distributed to all the islands from Oahu to Hawaii, and occurs from the coast up as high as 4,000 feet in the mountains. Like the other members of the genus, they store up caterpillars of medium sized Lepidoptera as food for their young. Their nests are made in hollow twigs or holes in trees, in holes in rocks, in burrows in earth banks, etc., according to what is convenient in the particular locality. A favorite place is the nests of the mud wasp (*Pelopaeus caementarius*). I once found them occupying a deserted paper wasp nest (*Polistes*) attached to underside of leaf of fan palm. They take possession of the empty cells of mud wasp nest, which are somewhat too large for them, however, so they divide them into two by a transverse partition of mud. They first put the desired number of caterpillars in the bottom of the cell, having paralyzed them by stinging them in ventral side, deposit an egg, then put in the mud partition, and fill up the outer part of the cell similarly, and seal up the opening with mud. When they use holes in rocks they are apt to use a hole about the proper size to hold caterpillars sufficient for one wasp larva to feed upon, and seal the opening with mud. In burrows in earth, or in hollow sticks, they may have several cells end to end.

The caterpillars which this species gathers are usually about an inch long, and they usually gather all one species for one cell, tho sometimes I have found them mixed. The number of caterpillars stored in one cell varies from 6 to 12. There is great variation in the size of the adult wasps, which is evidently due to the amount of food it had when a larva, i. e., the number of caterpillars which had been stored for it to feed on.

In many nests examined, the following species of caterpillars (all leaf-rollers) were found: *Omiodes accepta* (Cane Leaf-roller), *O. localis*, *O. monogona*, *O. blackburni*, *Hymenia recurvalis*, *Cacoecia*, sp., *Mecyna aurora*. These observations were taken at various places on Oahu, Maui and Hawaii. The species of caterpillar found in each case, was in accordance with the proximity to a place where there was an abundance of this particular species of caterpillar. When in the vicinity of sugar cane-fields where cane leaf-rollers are abundant, they capture a good many of these. Among the other caterpillars, those of the genus *Cacoecia* are collected in largest numbers. There are two species of these and they are leaf-rollers on almost every kind of tree, shrub and plant, planted or growing wild in the lower parts of the islands. The next most abundant caterpillar collected was *Hymenia recurvalis*, which is abundant on weeds of the Amarantaceae, on Purslane, and often on Beets.

### Life History

The egg is white, elongate, 2.5 mm. long, and suspended from the upper side of the cell by a filament of about the same length. One egg is placed in each cell of stored up caterpillars. The egg hatches in but a few days, and the whitish larva at once begins eating its food-supply of caterpillars. It grows rapidly, finishing its food-supply and becoming full grown in 5 to 7 days. It is then a fat, footless grub (Plate VI, fig. 5a) about 15 to 17 mm. long and 5 mm. thick, curved ventrally. In a day or two it spins a layer of whitish silk over the inner surface of the cell, not making a regular, close-fitting cocoon.

Pupation soon takes place. The pupa (Plate VI, fig. 5b) is white for several days; finally it gradually turns black a few days before it becomes adult. The pupal period is about 15 days. At times they may pass long periods of time as full-grown larvae in their cells before pupation, probably a provision to enable them to survive long periods of drought in some of the drier regions. I found such a larva in a mud wasp's nest, June 5th, 1906. It remained in this condition in a tube in the laboratory of the experiment station till Dec. 9th, 1906, when it pupated. This was a period of a little over 6 months as a full-grown larva, and there is no knowing how long it had been in this condition when discovered. Pupation took place after a period of about 2 weeks of rainy weather with " Kona" storms. It remained in pupal stage 18 days, when the adult was fully developed.

### Parasite (*Ageniaspis* sp?) (Plate VI, fig. 6)

Unfortunately the good work of *Odynerus nigripennis* is much checked by reason of its being parasitized by a very small Chalcid Fly. This parasite I have found widely distributed on Hawaii, Maui and Oahu. In a number of instances I have bred them from *O. nigripennis* larvae; and much oftener have found in *nigripennis* nests the empty larval skin from which the parasites emerged. The *nigripennis* larvae are allowed to become full-grown; the numerous tiny larvae of the parasite feeding inside, and pupate shortly after the host larva is full-grown. They completely fill the latter and can be seen through the transparent skin, packed so close that the skin has bulges where it conforms to the pupae inside. I have bred 105 parasites from one wasp larva. They escape from the mud cell of the wasp by gnawing a tiny hole through the plug of mud which sealed it.

*Polistes aurifer* Saus.
*Polistes hebraeus* Fab.
*Polistes macaensis* Fab.

Fauna Hawaiiensis, I, Pt. I, pp. 29, 30, 1899.

These three species of wasps are very common thruout the islands. They are commonly known as "yellow jackets," and build paper nests under eaves, etc., of buildings, and also other sheltered places. They are very common in cane fields, in search of "honey dew." They also catch leaf-rollers to some extent. They appear to skin the caterpillar, chewing up the outer muscular body-walls into a pulpy mass to carry away to their nests to feed their young.

*Xiphidium varipenne* Swezey.

Swezey, H. S. P. A. Exp. Station, Ent., I, Pt. 7, p. 212, 1905.

This very abundant grasshopper, which preys upon the cane leaf-hoppers, I have also observed feeding upon cane leaf-rollers (*Omiodes accepta*) in cane-fields. It probably feeds upon other, grass-feeding *Omiodes* as well.

*Oechalia griseus*, Burm.

Fauna Hawaiiensis, III, Pt. II, p. 171, 1902.

This large native predaceous bug, I have seen in a few cases feeding upon cane leaf-rollers (*Omiodes accepta*). It was in cane-fields of elevated parts of plantations where they were near to native forests where this bug lives.

*Planarian Worm.*

I have observed an introduced worm feeding upon leaf-rollers in the mountains of Oahu. They attacked the caterpillars within their retreats. I observed them feeding on ***Omiodes accepta*, *Omiodes asaphombra*** and ***Omiodes monogramma*.** No doubt they feed on other species as well. I have found this worm beneath leaf-sheaths of cane at the Experiment Station grounds, where it probably had fed on larvae of bud moth or some dipterous larvae.

Table of the parasites of Omiodes, so far as they are known.

| HOST | PARASITES |
|---|---|
| *Omiodes accepta* | *Macrodyctium omiodivorum* |
| | *Echthromorpha maculipennis* |
| | *Pimpla hawaiiensis* |
| | *Limnerium blackburni* |
| | *Chalcis obscurata* |
| | *Trichogramma pretiosa* |
| | *Frontina archippivora* |
| | *Chaetogaedia monticola* |
| *Omiodes localis* | *Limnerium blackburni* |
| *Omiodes demaratalis* | No parasites bred |
| *Omiodes continuatalis* | *Chaetogaedia monticola* |
| *Omiodes anastrepta* | No parasites bred |
| *Omiodes antidoxa* | " " " |
| *Omiodes monogramma* | " " " |
| *Omiodes iridias* | " " " |
| *Omiodes asaphombra* | *Sierola dichroma* |
| *Omiodes blackburni* | *Macrodyctium omiodivorum* |
| | *Echthromorpha maculipennis* |
| | *Pimpla hawaiiensis* |
| | *Limnerium blackburni* |
| | *Chalcis obscurata* |
| | *Trichogramma pretiosa* |
| | *Frontina archippivora* |

| HOST | PARASITES |
|---|---|
| *Omiodes meyricki* | *Trichogramma pretiosa* |
| *Omiodes monogona* | *Limnerium blackburni* |
| *Omiodes epicentra* | Younger stages unknown |
| *Omiodes euryprora* | " " " |
| *Omiodes telegrapha* | " " " |

Table of parasites and their hosts.

| PARASITE | HOSTS |
|---|---|
| *Macrodyctium omiodivorum* | *Omiodes accepta* |
| | *O. blackburni* |
| | *Cacoecia* sp. |
| *Chelonus blackburni* | *Hymenia recurvalis* |
| | *Phlyctaenia despecta* |
| | *Homoeosoma humeralis* |
| | *Phthorimaea operculella* |
| *Echthromorpha maculipennis* | *Omiodes accepta* |
| | *O. blackburni* |
| | *Plusia chalcites* |
| | *Cacoecia* sp. |
| | *Vanessa tamehameha* |
| *Pimpla hawaiiensis* | *Omiodes accepta* |
| | *O. blackburni* |
| | *Cocoecia*, 2 species |
| | *Tortrix* sp. |
| | *Azinis hilarella* |
| *Limnerium blackurni* | *Omiodes accepta* |
| | *O. blackburni* |
| | *O. monogona* |
| | *O. localis* |
| | *Phlyctaenia despecta* |
| | " *stellata* |
| | *Pyrausta constricta* |
| | *Homoeosoma humeralis* |
| | *Cacoecia* sp. |
| | *Phthorimaea operculella* |

| PARASITE | HOSTS |
|---|---|
| *Sierola dichroma* | *Omiodes asaphombra* |
| *Chalcis obscurata* | *Omiodes accepta* |
| | *O. blackburni* |
| | *Phlyctaenia despecta* |
| | *P. stellata* |
| | *P. nigrescens* |
| | *Cacoecia*, 2 species |
| | *Tortrix*, 2 species |
| | *Plusia chalcites* |
| *Trichogramma pretiosa* | *Omiodes accepta* |
| | *O. blackburni* |
| | *O. meyricki* |
| | (In U. S. A.) |
| | *Aletia argillacea* |
| | *Heliothis armigera* |
| | *Mamestra picta* |
| | *Cydia pomonella* |
| | *Diatraea saccharalis* |
| *Frontina archippivora* | *Pieris rapae* |
| | *Anosia plexippus* |
| | *Vanessa cardui* |
| | *Leucania unipuncta* |
| | *Agrotis dislocata* |
| | *A. crinigera* |
| | *Spodoptera mauritia* |
| | *S. exigua* |
| | *Scotorythra rara* |
| | *Omiodes accepta* |
| | *O. blackburni* |
| *Chaetogaedia monticola* | *Leucania unipuncta* |
| | *L. pyrrhias* |
| | *Agrotis dislocata* |
| | *A. cinctipennis* |
| | *Spodoptera mauritia* |
| | *Noctuid*, species undetermined |
| | *Plusia chalcites* |
| | *Cosmophila sabulifera* |

| PARASITE | HOSTS |
|---|---|
| *Chaetogaedia monticola* | *Scotorythra rara* |
| | *Omiodes accepta* |
| | *O. continuatalis* |
| | *Phlyctaenia monticolans* |
| | *Hymenia recurvalis* |
| | *Vanessa cardui* |

## EXPLANATION OF PLATES.

Except where otherwise given the magnification of each figure is given with its number on the Plate; thus: 1x2.

### PLATE I.

All figures are of the Sugar Cane Leaf-Roller (*Omiodes accepta*).

1. Adult moth.
2. Caterpillar, side view.
3. " dorsal view.
4. " 4 anterior segments.
5. " front view of head.
    e, eye cluster.
    c, cervical shield.
    s, spiracles.
    d, dorsal row of tubercles. (In fig. 4=posterior trapezoidal).
    sp, supra-spiracular row of tubercles.
    sb, sub-spiracular row of tubercles.
6. Pupa, side view.
    e, eye.
    a, antenna-case.
    l, leg-case.
    w, wing-case.
    s, spiracles.
    c, cremaster.
7. Apex of cremaster, showing the curled spines by which the pupa is fastened to the cocoon.
8. Cluster of 4 eggs in groove on surface of leaf.
9. Eggs more highly enlarged.
10. Leaf spun together for "retreat" or hiding place of caterpillar; shows where caterpillar has eaten, (Nat. size.)
11. Leaf, showing spots where a very young caterpillar has eaten, leaving one epidermis intact, instead of eating holes thru the leaf, (Nat. size.)

### PLATE II.

1. *Omiodes localis.*
2. *O. continuatalis.*
3. *O. demaratalis.*

4. *O. epicentra.*
5. *O. asaphombra.*
6. *O. iridias.*
7. *O. anastrepta.*
8. *O. antidoxa.*
9. *O. monogramma.*
10. *O. blackburni.*
11. *O. monogona.*
12. *Hymenia recurvalis.*

## PLATE III.

Side view of head and three anterior segments, and front view of head of caterpillars, to show markings peculiar to each species.

1. *Omiodes asaphombra.*
2. *O. iridias.*
3. *O. localis.*
4. *O. demaratalis.*
5. *O. anastrepta.*
6. *O. antidoxa.*
7. *O. monogramma.*

## PLATE IV.

1. *Omiodes continuatalis*, lateral view of 4 anterior segments of caterpillar.
2. " " front view of head of same.
3. " " dorsal view of 3 posterior segments.
4. *O. blackburni*, lateral view of 4 anterior segments of caterpillar.
5. " " front view of head of same.
6. *O. monogona*, lateral view of 4 anterior segments of caterpillar.
7. " " front view of head of same.
8. " " egg on under surface of leaf.
9. *Hymenia recurvalis*, lateral view of 4 anterior segments of caterpillar.
10. " " front view of head of same.
11. " " pupa.

## PLATE V.

1. *Macrodyctium Omiodivorum.*
2. " eggs on surface of caterpillar of ***Omiodes accepta.***
3. " 5 larvae feeding on outside of caterpillar of *Omiodes accepta.*
4. " 9 cocoons on cane leaf near the dried remains of a caterpillar upon which the larvae fed. The holes in cocoons are where the adult parasites gnawed out. All were inside a "retreat" of ***Omiodes accepta,*** which has been opened, (Nat. size).
5. *Pimpla hawaiiensis.*
6. *Echthromorpha maculipennis.*

## PLATE VI.

1. *Chelonus blackburni,* adult.

1a. " " full-grown larva, finishing the eating of a caterpillar, (x 10).

1b, 1c, 1d, Cocoons of *Hymenia recurvalis*; (Nat. size).

1c, contains normal sized caterpillar.

1b, contains dwarfed caterpillar due to parasitization by *Chelonus.*

1d, contains full-grown larva of *C.* ***blackburni,*** which has consumed the caterpillar of *H. recurvalis* and is now beginning to spin its own cocoon.

2. *Limnerium blackburni.*

3. *Chalcis obscurata.*

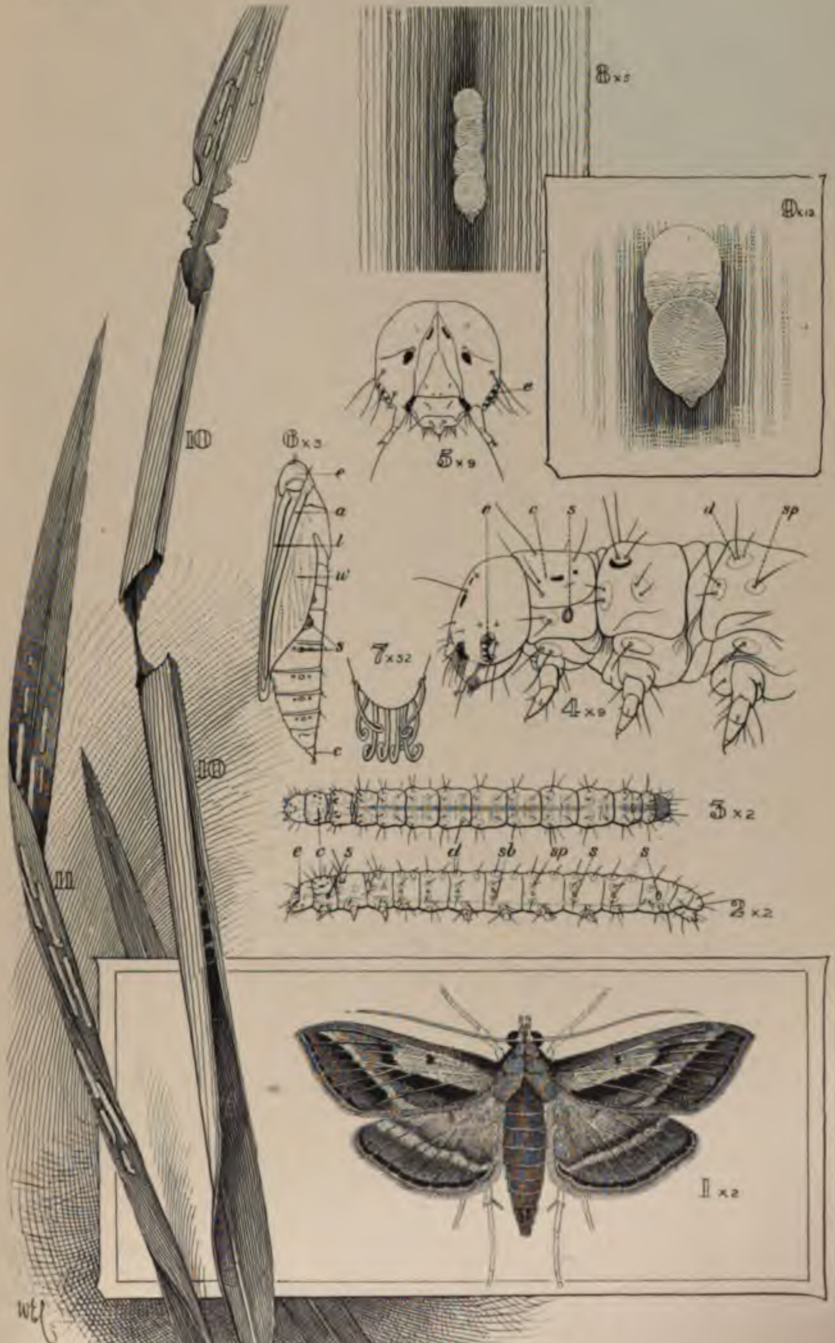
4. *Frontina archippivora.*

5. *Odynerus nigripennis.*

5a. " " larva.

5b. " " pupa.

6. *Ageniaspis* sp.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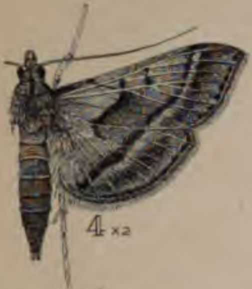

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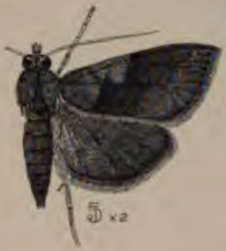

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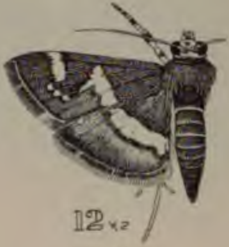

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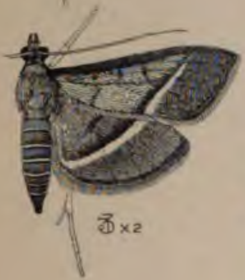

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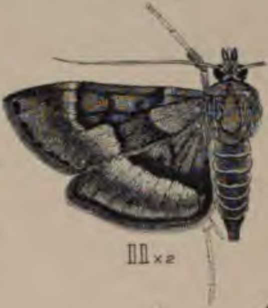

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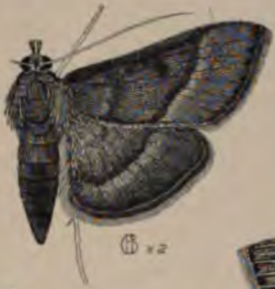

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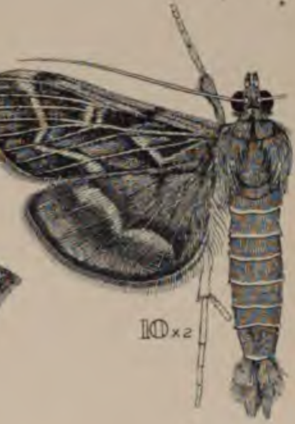

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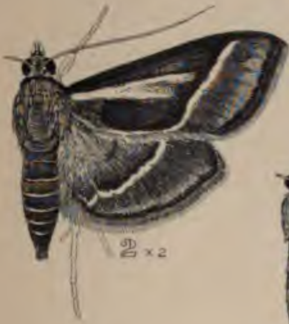

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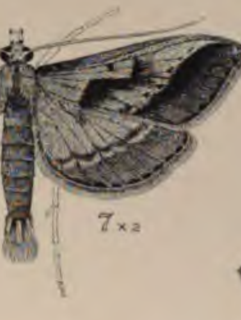

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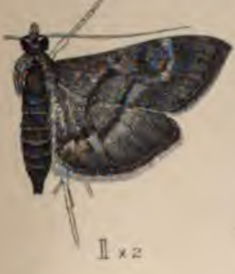

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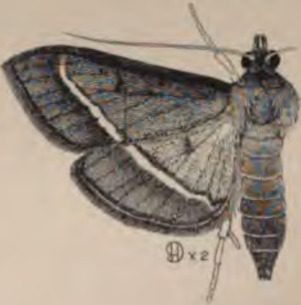

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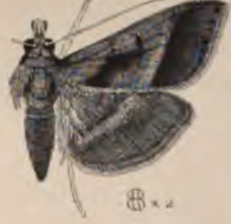

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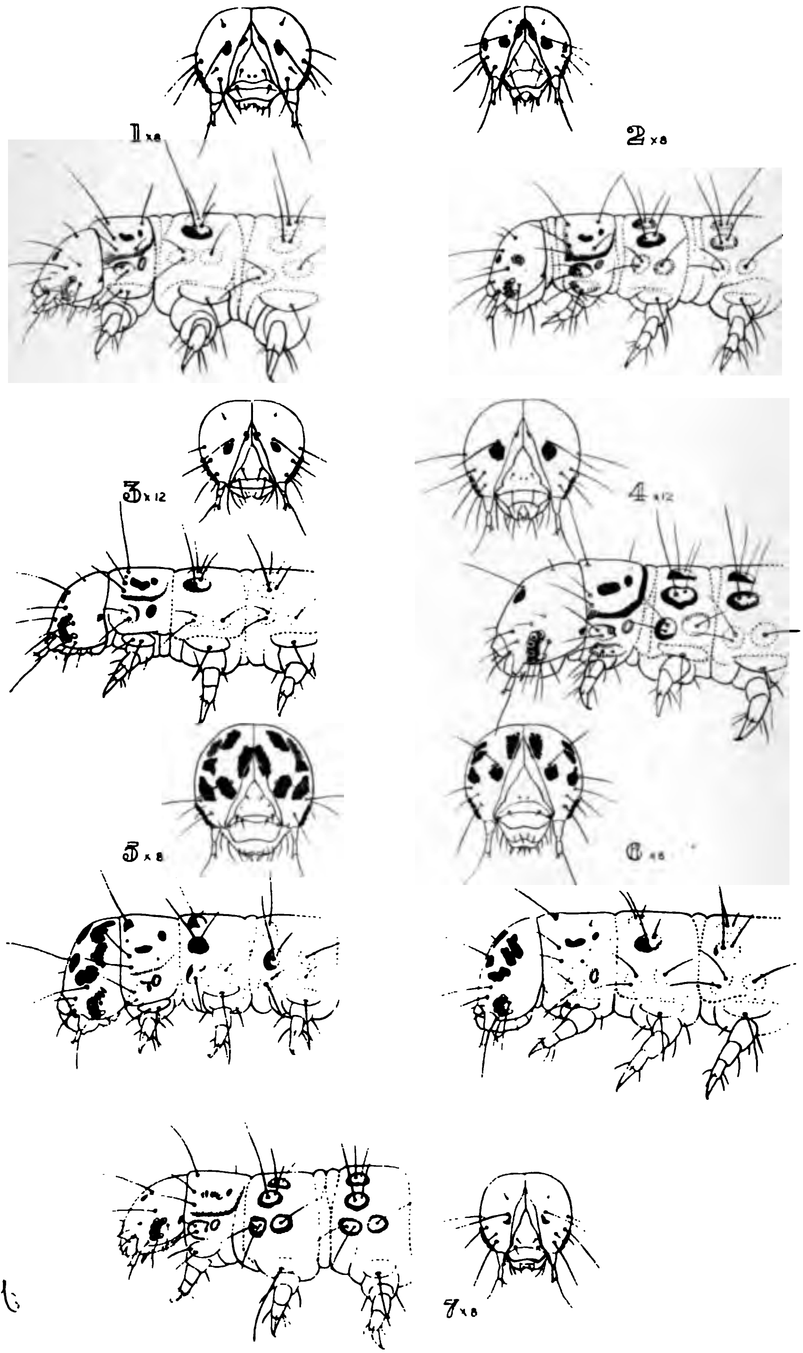

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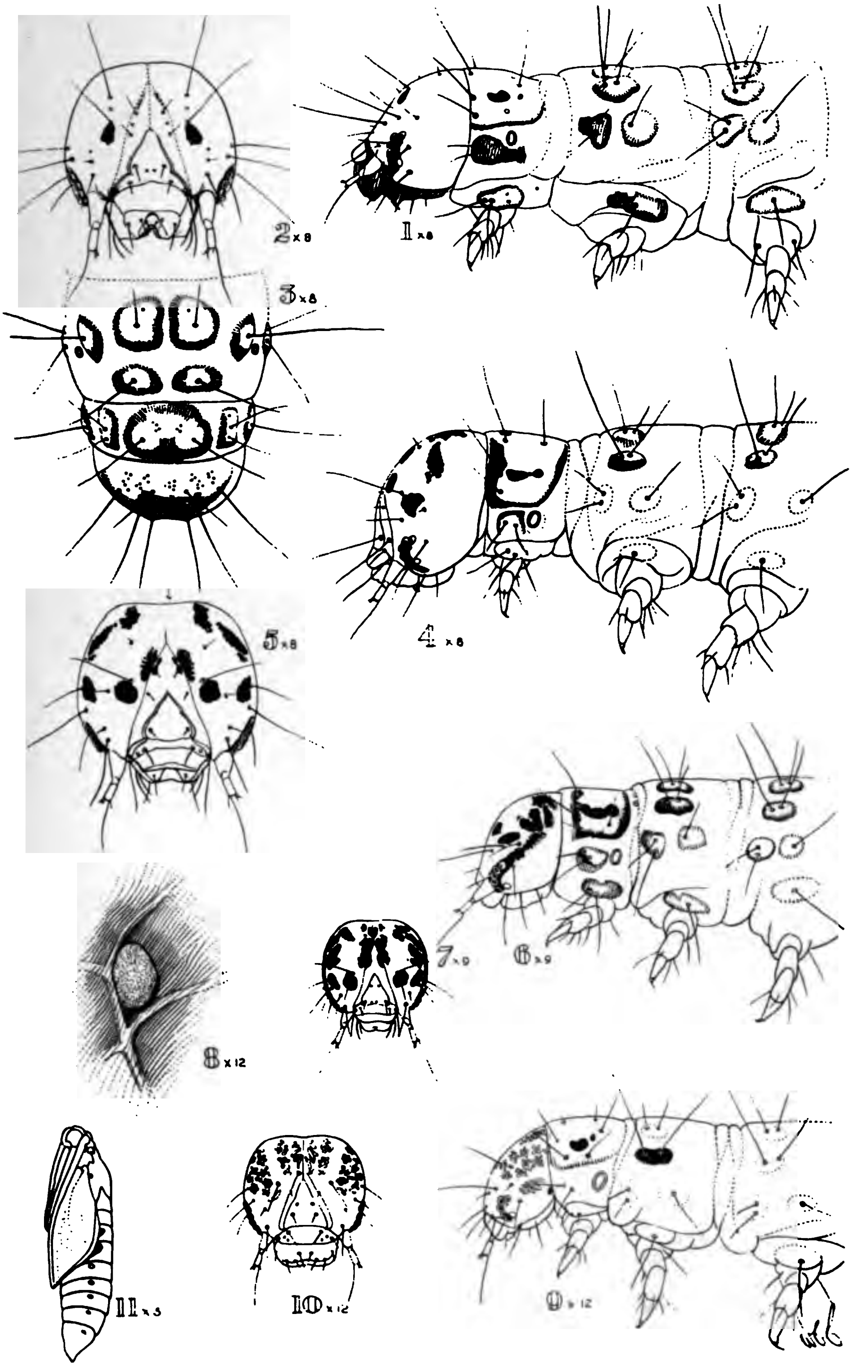

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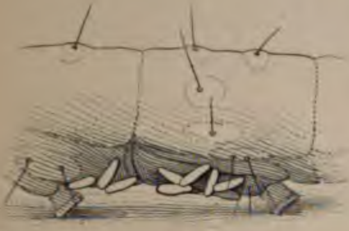

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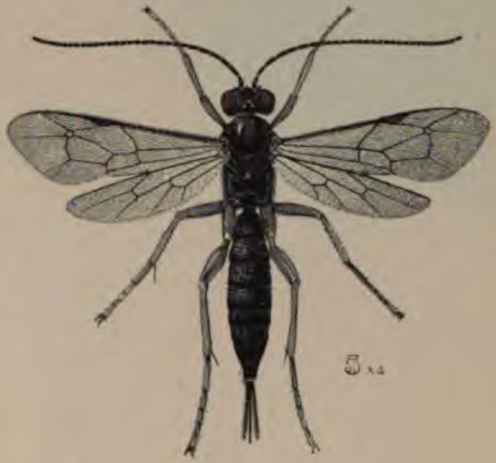

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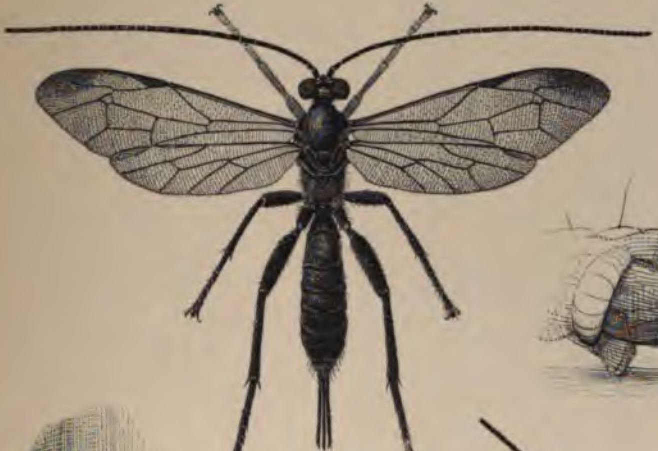

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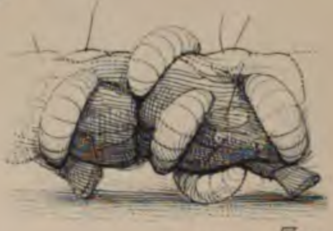

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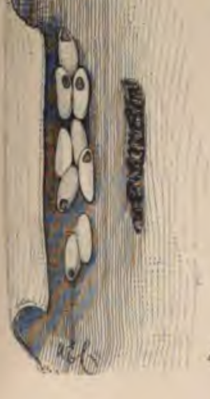

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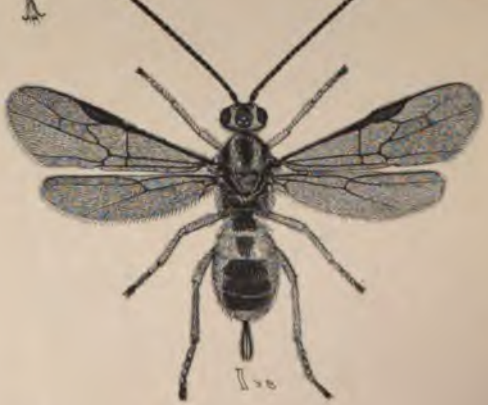

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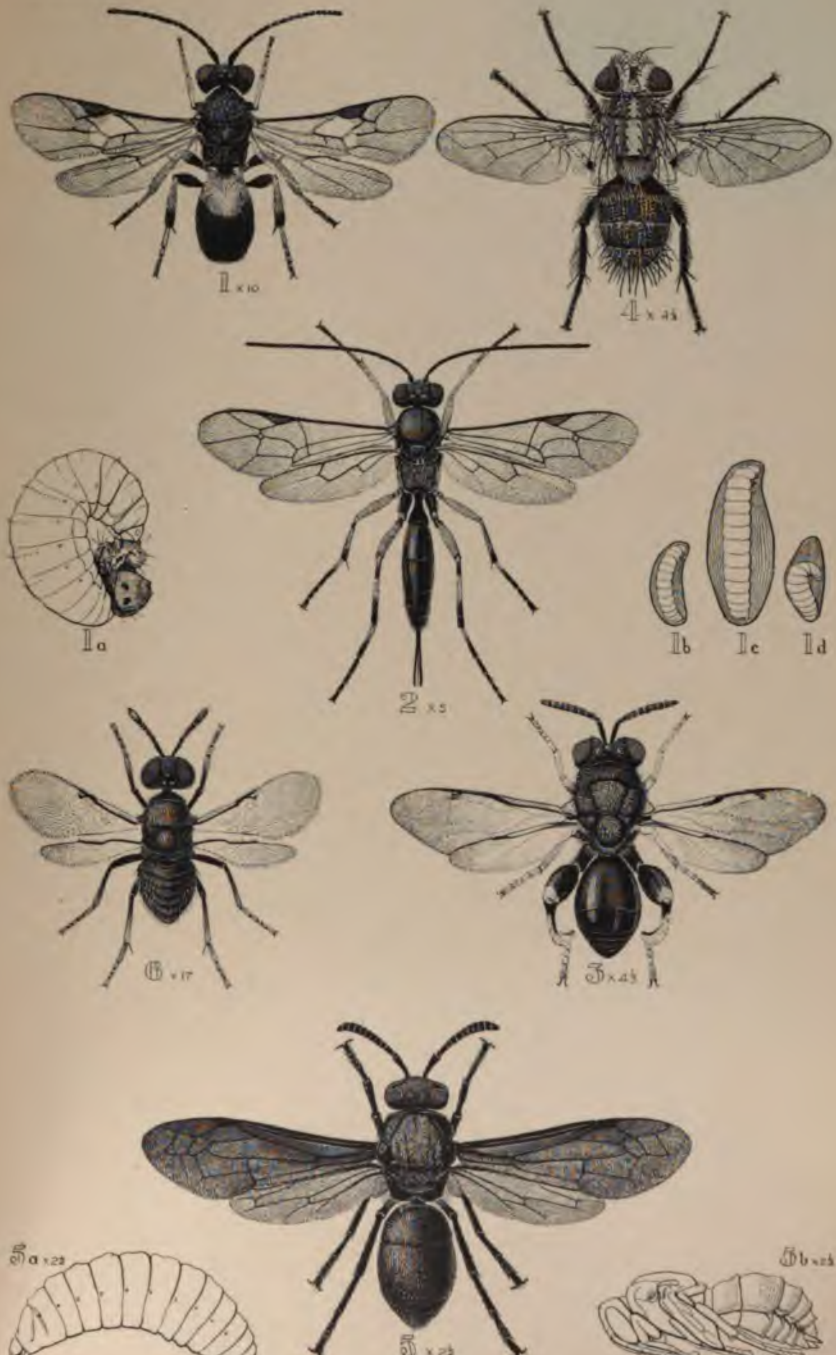

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## ERRATA

Page 6, line 6, for "*monograma*" read "*monogramma*."
Page 18, line 32, for "these" read "there."
Page 20, line 38, for "family" read "faintly."
Page 26, line 6, for "*Tricogramma*" read "*Trichogramma*."
Page 45 line 23, for "*obsurata*" read "*obscurata*."
Page 48, line 18, for "*carduii*" read "*cardui*."

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# The Hawaiian Sugar Cane Bud Moth (*Ereunetis flavistriata*) With an Account of Some Allied Species and Natural Enemies.

BY OTTO H. SWEZEY

HONOLULU, HAWAII
OCTOBER 25, 1909

595
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# LETTER OF TRANSMITTAL.

---

To the Experiment Station Committee of the Hawaiian Sugar
Planters' Association, Honolulu, Hawaii.

GENTLEMEN:—I herewith submit Bulletin VI of the Division of Entomology. It has been prepared by Mr. Otto H. Swezey, and is entitled "The Hawaiian Sugar Cane Bud Moth (*Ereunetis flavistriata*), with an Account of some Allied Species and Natural Enemies."

Yours obediently,

G. W. KIRKALDY,

Acting Director, Division of Entomology.

Honolulu, Hawaii, August 2, 1909.

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# INTRODUCTION.

The bud moth (*Ereunetis flavistriata*) is apparently not a native insect, although it is not at present known elsewhere. It is an example of an insect of other habits becoming attached to an introduced cultivated plant, i. e., sugar cane. It is always to be found in the cane fields of the Hawaiian Islands, and usually very numerous; but it also retains its habits of feeding on various other plants. It is usually not particularly injurious, as it customarily feeds on the dead and drying tissues of the leaf sheaths of sugar cane; but when very numerous and on particularly soft varieties of cane the caterpillars do considerable eating of the epidermis, and also eat into the buds and destroy them, occasioning a good deal of loss where the cane is desired for cuttings to plant.

Associated with this species are often also the caterpillars of several other species of moths, some of which feed in dead cane sticks or in the tunnels of the cane borer (*Sphenophorus obscurus*) as well.

This bulletin treats of the habits of the bud moth and its lepidopterous associates, and also their parasites so far as any are known.

Of the twenty or more species of *Ereunetis*, very little is known regarding their habits. They are distributed from West Indies to Marquesas, Fiji, Hawaii, New Zealand, Australia, India, and Ceylon; but there are only two species which are known from more than one locality: *minuscula* in West Indies and Hawaii; *simulans* in Hawaii, Marquesas, Fiji, and Ceylon. Aside from the species herein treated, one species (*iuloptera*) in Australia has been bred from a pupa in bark of a fibrous-barked species of Eucalyptus (Meyrick).[1] An Indian species (*seminivora*) was bred from a pod of *Cassia occidentalis* (Walsingham).[2] This is in accord with the habits of our species; for of our five species, *simulans* feeds on bark and wood of dead trees; *minuscula* in dead wood and pods of various leguminous trees and plants; *flavistriata* on dead leaves, etc., of sugar cane, palms, and various other plants. It is probable that when the habits of other species of the genus are studied, they will be found quite similar.

---

[1] P. L. S., N. S. W., V, p. 260, 1881.

[2] Indian Museum Notes, IV, p. 107, Pl. VII, Fig. 2, 1899.

The same can be said for the genus *Opogona*. About two dozen species are known, but the habits of only a few of them are known. In Java, caterpillars of *dimidiatella*[3] feed on sugar cane, eating the surface of the young roots at the base, causing them to die. They also sometimes enter the passages of the borers; but chiefly live on dead tissues; hence, are not particularly injurious, especially as they are not numerous. In New Guinea, *saccharella* has similar habits to the above. In Java, *fumiceps*[4] is reported as feeding on the coconut palms. In Mauritius, *subcervinella*[5] is reported to feed on sugar cane, potatoes, and other stored tubers. The larva of *lachanitis*[6] was found feeding in the fungus beds of the common termite, in Ceylon. Our two species both feed in dead sugar cane, rotten wood, and various other decaying substances.

I have included four species of moths sent by Mr. Muir from New Guinea, where their larvae feed in cane similarly to the way that some of our species do here. Of these moths, two species are *Ereunetis* (both new species), and two are *Opogona* (one new species). I have included them, as it is a matter of considerable interest to know that elsewhere some of the species of these two genera have the same habits that the Hawaiian species have. I have no doubt but that when the habits of those species of these genera whose habits are at present unknown, are studied, they will be found to be quite similar to those already known.

Habits of the other genera herein treated are mostly as little known. *Cryptoblabes* has about a dozen species. Of these, in Europe, the larva of *bistriga*[7] feeds in folded leaves of oak and alder. I have found nothing published in regard to habits of other species.

Of *Batrachedra*, more is known, for discussion of which see under *B. rileyi*, page 23 of this bulletin.

There is very little parasitization of any of these species of moths so far as I have been able to observe. Probably of the few treated of in this paper none are of any special importance, tho one or two of them were found locally quite abundant at one time on the bud worm, yet there was no appreciable diminution in their numbers.

---

[3] Van Deventer, Hanboek ten dienste van de Suikerriet-cultur en den Rietsuiker-fabricage op Java, II, p. 165, Pl. 22, Fig. 12, 1906.

[4] Van Deventer, Tijd. Ent., XLVII, p. 83-84, Pl. X, Figs. 1a, 1b, 1904.

[5] Walsingham, Fauna Hawaiiensis, I, Pt. V, p. 713, 1907.

[6] Meyrick, Bombay J. Nat. Hist. Soc., p. 416-417, 1906.

[7] Meyrick, Handbook of British Lepidoptera, p. 381, 1895.

## FAMILY TINEIDAE.

### *Ereunetis flavistriata* Wlsm. (Sugar Cane Bud Moth.)
(Plate II, Figs. 1-6.)

"Antennae yellowish-white, with two small grey spots above before the apex. Palpi yellowish-white, brush-like beneath; the terminal joint very short. Head and thorax yellowish-white. Forewings yellowish-white, indistinctly streaked with broken yellow lines along the fold, along the cell, and below the costa beyond the middle; also sparsely speckled with black scales, especially beyond the middle; a short blackish streak at the upturned apex runs to the end of the apical cilia and is joined by a slender golden brown streak along the base of the shining, white costal cilia; terminal cilia whitish cinereous, with a blackish spot in their middle below the apex. Exp. al. 14 mm. Hindwings shining, pale golden yellowish, becoming white at the apex; cilia pale yellowish-grey. Abdomen and legs yellowish-white." [Walsingham, "Fauna Hawaiiensis," I, Pt. V, p. 716, 1907.]

This moth is variously known as the "bud moth," "budworm," or "sheath moth" of the sugar cane. It is very abundant in all cane fields throughout the Hawaiian Islands. The larvae are always to be found beneath the leaf-sheaths of the older leaves which are partially or completely dead and dried. They are most abundant where no stripping has been done or where there is more or less of a tangled mass of leaves. They normally feed upon the dried leaf-sheaths themselves, also on the leaves. On the sheath they feed on the inner side towards the cane stalk, eating out between the strands of fibers, often burrowing into the substance of the leaf-sheath (Plate I, Fig. 1). Besides their normal feeding, however, they often eat off the surface of the rind for considerable areas, particularly at or just above the nodes where it is apt to be softer; but they sometimes eat off the surface from a whole internode. This eating of the surface is most likely done while the rind is yet growing, before it becomes hardened.

Besides all this, the worst damage is done when they eat out the buds or "eyes," which they sometimes do for several in succession, or for from one to three feet of the cane stalk (Plate I, Fig. 2). The eating of the leaf-sheaths and the leaves does no apparent injury to the cane, as the eating is done on the dead or nearly dead leaves; but the eating of the rind may be considered as injurious in the extent to which it may allow an entrance for fungus spores, etc. The eating of the "eyes" is a serious injury, however, not alone from its producing a condition, or an opportunity for the admission of fungus spores; but chiefly by its rendering the cane valueless for "seed." This would not apply of course where only "top-seed" is used for planting, as usually this is higher than where the "bud worms" are accustomed to feed; but where, as is often the case, short ratoons are used for seed, and the whole of the stick used, the cuttings from the lower part, or even the whole stick, may be quite worthless for planting on account of the number of "eyes" which have been eaten by this insect. The eating is often done in such an obscure way as to be readily overlooked. Usually the larva eats a tiny hole through the outer scales of the bud and consumes the inner soft portion. This entrance hole may be made at the base of the bud, or behind it, where not readily seen; hence, the extent of the injury is not always conspicuous, but thorough examination should be made of any doubtful cuttings where the larvae are noticed in abundance. Their presence is made known (even though not seen themselves), by the silken web by which they partially conceal themselves and endeavor to protect themselves from enemies, and also by the numerous tiny pellets of excrement which are always present where they have been feeding, whether at the base of leaves, or on the outside or inside of the leaf-sheaths.

The larvae of this moth also feed on dead leaves of palms, bananas, pineapples, and *Pandanus*; and amongst the bananas on the bunch eating dead tissues and sometimes the skin of the fruit. They are also often numerous amongst the fibrous material at base of palm leaves; and frequently amongst the bracts at base of pineapples. In none of these places, however, are they to be considered injurious, merely feeding on dead tissues.

## LIFE HISTORY.

The eggs (Plate II, Fig. 3) are laid singly, or often a few near together, on the inner surface of the leaf-sheath, sometimes on the outer surface as well, deposited lengthwise in the slight longitudinal grooves of its surface. I have counted as many as twenty-three on one sheath, sixteen of which were within a distance of an inch and a half. When deposited on the inner surface of the leaf-sheaths, of course, it is only on those which have separated at the top to allow the entrance of the moth. An egg is oval-oblong, about 0.75 mm. long and 0.25 mm. wide, upper surface convex, finely reticulated, and with three to seven nearly parallel longitudinal carinae; whitish, or more or less pearly iridescent. The length of time before hatching is about two weeks or more. The length of the larval period is quite long considering the size of the larva. One which I reared became full-grown in eight weeks from time of hatching.

The full-grown larva (Plate II, Figs. 4, 5) is about 12 to 15 mm. It is cylindrical, with the head and the anterior segments about the same width as the rest of the body. It is of a dirty whitish color; head pale reddish-brown and eyes dark. The head is horizontal and somewhat retracted into the segment behind it, which is somewhat infuscated; there are also some fuscous spots on the sides of this, and the next segment. Tubercles fuscous-centered at the base of hairs; tubercle ii about twice as far from dorsal median line as tubercle i; iii just above spiracle; iv posterior to spiracle and lower; v below spiracle and anterior of it. Spiracles circular, pale yellowish, minute.

The pupa (Plate II, Fig. 6) is 5.5 to 6 mm.; very pale yellowish-brown, eyes darker; head with a compressed protuberance in front which is rounded above, but with a sharp angle below, this is darker than rest of pupa; fine hairs situated same as on caterpillar; all of abdominal segments except first and second movable; near basal dorsal margin of segments four to eight is a slight transverse ridge armed with a row of numerous short spines which probably assist in emerging from cocoon; cremaster has two short, stout spines on dorsum, slightly curved forward, and two short conical ones ventrally, wide apart; wing-cases extend to about apex of fifth abdominal segment, free beyond third segment; antenna- and leg-cases extend about two segments farther.

The pupa is formed within a cocoon made in the same location in which the larva has been feeding (Plate I, Figs. 3, 4). It is 6 to 10 mm. long and usually has an outer layer of fibrous material from the leaf-sheath where the larva fed; sometimes it is covered with a layer of pellets of excrement instead, and if the larva has fed on the outside of the leaf-sheath of a variety of cane having numerous bristles on the leaf-sheaths, the cocoons will be covered with these, the latter and the fibers are laid on lengthwise of the cocoon and make it spindle-shaped, one side of cocoon is made onto the surface of leaf-sheath or whatever it is attached to. The moth emerges in about two or three weeks.

The adult moth is about 12 mm. with the wings spread; with them folded at rest on the back the insect is 5 mm. It is not conspicuous when at rest, on account of its pale color and the fact that it rests so close to the object it is on, usually the under side of the cane leaf, and often in the hollow next to the midrib. They may often be seen flying when the cane is disturbed. They are of a yellowish-white color (sometimes greyish-white) with a few yellower streaks and numerous black dots on forewings. There is a black streak at apex of wing which is sharply upturned.

### *Ereunetis minuscula* Wlsm.

(Plate II, Figs. 7-9.)

"Antennae rather stout, enlarged at the base, simple in the male; creamy white. Palpi projecting more than the length of the head beyond it, brush-like beneath; creamy white. Head rough; cream-colored. Thorax cream-colored. Forewings cream-colored; more or less shaded and speckled with umber-brown, this shading being concentrated (and therefore more conspicuous) from the base along the first half of the fold, from beyond the middle of the costa to the lower angle of the cell, and in a subapical oblique costal streak; a dark fuscous streaklet immediately before the extreme apex is preceded by a whitish costal patch; the termen deeply incised below and opposite to it, causing the apex of the wing to turn up sometimes almost at right angles to its surface; cilia creamy whitish, with a slender reduplicated umber-brown line close to their tips. Exp. al. 9 mm. Hindwings, male, with a hyaline patch at the base; pale golden yellowish, sometimes with a cupreous tinge; cilia whitish, with a slight golden or cupreous tinge, a slender reduplicated curved line of umber-brown running through them around the extreme apex. Abdomen whitish-ochreous. Legs creamy white." [Walsingham, "Fauna Hawaiiensis," I. Pt. V, p. 716. 1907.]

This moth is closely related in habits to the preceding, except that I have never yet found its larvae feeding in cane, though I have taken the moth in cane fields. It is more common to find them feeding on the dead leaves of palm, banana, pandanus, etc., and in the dry and decaying pods of various legumes, as tamarind and various Cassias. I have also found them in decaying stems of various woody plants. They are also usually to be found among the dead bracts at the base of pineapples, not injurious to the pineapples, however; in fact, I do not at present know of any injuries caused by them, as they habitually feed on dead plant substances. I once found them quite numerous on lantana bushes which were infested by *Orthezia insignis,* and had numerous larvae also of *Cryptoblabes aliena*, *Thyrocopa abusa*, and *Batrachedra rileyi* feeding on the dying bushes or the debris caused by one or another insect being present.

The larva (Plate II, Fig. 8) is very similar to that of the preceding species, but paler, of a whitish appearance; tubercles not fuscous and no fuscous markings behind cervical shield. The pupa (Plate II, Fig. 9) differs by having four teeth close together ventrally on cremaster, instead of two, wide apart; there is also a sort of transverse dorsal pit between segments six and seven; and the frontal protuberance on the head is wider and bounded by two carinae which converge dorsally, less sharply pointed ventrally. The cocoon is similar to that of *flavistriata.*

### *Ereunetis penicillata* n. sp.

Very similar to *E. minuscula,* but the male has an elongate, oval, yellowish-brown patch of modified scales in cell of forewing below; and a strong, yellowish-brown costal hair-pencil on hindwing; while the transparent spot near base of cell in hind wing of *minuscula* is lacking.

The pupa is similar to *minuscula* also, except that it has a short conical tooth on each side of cremaster instead of the four ventral ones in *minuscula*; the frontal protuberance more prominent, with the two carinae contiguous.

I bred two males of this species from cocoons in fallen dried Pandanus leaves at Kilauea, Kauai.

### *Ereunetis simulans* (Butl.).

(Plate II, Figs. 10-12.)

"Antennae white, annulate with brownish cinereous, basal joint white. Palpi porrect, with large expanding brush beneath, extending to the tip: white. Head white. Thorax white, with a blackish spot on the anterior margin and another posteriorly; the base of the tegulae blackish. Forewings creamy white, with large clearly defined blackish spots or patches (varying in different specimens); the first near the base of the costa extends obliquely outward and is narrowly connected along the extreme margin with a large quadrangular costal patch, at one-third, reaching to the fold and there connected at its inner angle with a small patch below the fold; near the base is a small triangular dorsal patch opposite the first costal; scarcely beyond the middle is a smaller quadrangular costal patch, followed half way to the apex by an irregularly triangular costal patch with serrate inner margin (its apex sometimes connected narrowly with the terminal shading), between these two, but below them, is a distinctly triangular patch on the lower angle of the cell, its apex reaching nearly to the fold; two smaller dentate dorsal patches tend obliquely outward, the first about the middle, the second about the tornus; a roundish patch at the upturned apex of the wing is partly connected by scattered scales with a less distinct diffused patch on the middle of the termen; cilia white, tinged with fuscous on the middle of the termen, a fuscous line running through their middle. Exp. al. 20-23 mm. Hindwings and cilia rather shining, pale brownish cinereous. Abdomen and legs pale brownish cinereous, the tarsal joints whitish, slightly spotted with brown." [Walsingham, "Fauna Hawaiiensis," I, Pt. V, p. 715, 1907.]

This is larger than the preceding species and quite distinct from them in markings of the adult moth, it being white with black spots. These spots are larger in the females than the males.

The larvae of this species feed in dead wood, particularly the bark and outer parts of stems and trunks. The "hau" tree is a great favorite with them, but many other species are attacked as well. Their presence may be known by the numerous black pellets of excrement, which are to be seen on the outside of the bark and in crevices, where they cling by the web which the caterpillars produce in abundance.

The eggs are white, about .5 mm. long by about as much in diameter, cylindrical, rounded at the ends, a little larger at one end on which is a circle of elongate spines bifid at tip, placed close together; surface slightly corrugated. They are deposited by the female in crevices and beneath loose pieces of bark, quite a number in a batch. In some batches twenty-seven, forty-seven, and fifty respectively were counted. They were quite regularly placed, flattened somewhat by being crowded beneath the bark.

The full-grown larva (Plate II, Fig. 11) is 25-30 mm. long, of a dirty whitish color; the head dark reddish-brown; cervical shield with a wide transverse blackish-brown band; segment three mostly pale brownish, the tubercles of other segments of the same color; spiracles circular, pale brownish.

Pupation takes place in a tough cocoon in a tunnel in which the caterpillar has lived, it being either near the outside, or else has one end near the outside so that the moth may readily emerge. The empty pupa cases may be seen projecting from these after moths have emerged. The pupa (Plate II, Fig. 12) is about 10 mm. long; quite similar to that of *minuscula* except that it is larger and has two conical teeth wide apart ventrally on cremaster instead of four close together as in *muscula;* and the frontal protuberance is more prominent, in lateral view the ventral point is about a right angle, and there is but one carina extending dorsally.

### *Ereunetis pilosata* n. sp.

Male, 9 mm. Antennae whitish-ochreous irregularly marked above with dark fuscous, basal segment dark fuscous, with pecten below. Palpi cinereous-fuscous. Head and thorax cinereous-fuscous. Forewings irregularly mixed with white and fuscous, and a sprinkling of black scales, a few pale brownish scales along dorsum and a spot at apex; cilia cinereous fuscous; apex upturned. Hindwings pale ochreous; cell on upper surface clothed with pale ochreous elongate scales; space between cell and costa clothed with long yellowish hairs; an oval transparent spot at base below lower margin of cell; cilia pale cinereous-ochreous, a few dark fuscous scales at apex. Abdomen fuscous mixed with ochreous, especially on the segmental margins. Legs fuscous, hind tarsi marked with whitish.

Two males, British New Guinea (Muir). The larva feeds in cane similarly to what *E. flavistriata* does in Hawaii.

### *Ereunetis muiriella* n. sp.

Female: 10 mm. Antennae whitish-ochreous faintly marked with fuscous. Palpi ochreous. Head pale grey. Thorax greyish-ochreous with a black spot posteriorly. Abdomen shining greyish-white. Forewings pale ochreous grey; a narrow black line on basal third of costa; a small black spot beneath costa near base; a black dot about the middle of fold; a tiny black dot in cell; four tiny black dots beneath outer half of costa; apical portion of wing with several suffused dark fuscous spots, cilia grey, spotted with dark fuscous around apex. Hind wings and cilia pale shining grey, a few fuscous scales at apex; oval transparent area below cell at base. Legs grey, tarsi fuscous-marked.

One female, British New Guinea (Muir). The larva feeds in cane similarly to what *E. flavistriata* does in Hawaii.

## *Opogona aurisquamosa* (Butl.).

(Plate III, Figs. 1-3.)

"Antennae very pale fawn-ochreous (almost whitish), the basal joint somewhat dilated and flattened, whiter than the stem. Palpi pale fawn-ochreous above, straw-white beneath. Head shining, pale fawn-brown; face shining, steel-white. Thorax shining, varying from brown to deep purplish. Forewings irridescent, dark purple, varying to pale fawn-brownish (but chiefly in worn or greasy specimens), with minute transverse lines of golden scales, more noticeable towards the apex than on the basal half, these coalesce in some specimens forming a costal spot before the apex, and occasionally a dorsal spot near the end of the fold; cilia dull pale brownish ochreous, varying to grey. Exp. al. 12-14 mm. Hindwings shining, bronzy greyish, with bright aeneous sheen around the margins, silvery white on the costa about the base; cilia dull pale brownish ochreous. Abdomen shining, pale fawn-brownish, varying to dark purplish grey. Legs pale ochreous." [Walsingham, "Fauna Hawaiiensis," I, Pt. V, p. 713, 1907.]

The larvae of this moth are often associated with bud-worms, and feeding in a similar manner; hence, they are also responsible for some destruction of the eyes of the cane. They occur more abundantly, however, feeding inside of diseased, dead, or rotten cane, especially in those shoots which have been choked or smothered and have died off at the top, and in cane sticks which have been attacked by borers. In the latter, many may often be found in old borer tunnels, feeding on the chewed-up cane left by the borer, or on the disintegrating substance of the cane itself. They also feed on decaying fruits and other decaying substances, on the dead leaves of bananas and palms, and in rotten wood. I have found them quite numerous in fruit clusters and dead stems of the castor oil plant, and in decaying bamboo stems, also in *Pipturus, Clermontia*, and other native trees in the mountains. I once reared quite a number of the moths from dried cow dung. They occur generally throughout the islands and are always found in cane fields, though not particularly injurious on account of their general feeding habits as given above. The species is also known in the Marquesas and the Society Islands.

The moths may often be seen at rest on the cane leaves. They are of a bronzy-yellowish color with metallic reflections. They are about ¼ inch in length with the wings folded over the back.

The wings are somewhat bent down at the tips. The antennae extended forward.

The full-grown larva (Plate III, Fig. 3) is about 15 to 18 mm. long, dull dirty white; finely pubescent, except head and segment two; head and cervical shield blackish-brown; tubercles slightly infuscated, especially those of segments two to four; tubercles i and ii in a straight longitudinal line, iii separated into two above the spiracle, iv and v below spiracle and about as far apart as iiia and iiib above; spiracles pale with black margins. Like *Ereunctis* larvae, they are of slow growth; the length of larval period has not been definitely determined.

The pupa (Plate III, Fig. 2) is 6-6.5 mm. in length; nearly uniform light brown, paler below, darker at extreme anterior end; fine hairs are situated where they were on the caterpillar; head bluntly, triangularly produced in front near ventral side; all of the abdominal segments movable, except first and second; near basal dorsal margin of segments four to eight is a slight transverse ridge armed with a row of numerous short spines, which assist in emerging from the cocoon at the time the moth emerges; cremaster has two short, stout spines on dorsum and slightly curved forward, two slight conical protuberances on ventral side; antenna- wing- and leg-cases extend to near middle of eighth abdominal segment, free beyond third segment.

The pupa is formed in a compact cocoon made in the place where the larva has fed. The cocoon is about 8 mm. long by 2.5 mm. in diameter, rounded at the ends and covered with frass and other debris, few fibers of the cane or leaves, etc.; at each end, a strip of white silk extends out about 5 mm. onto the surface of whatever the cocoon is attached to. About ten days are passed in the pupal stage.

### *Opogona apicalis* n. sp.

(Plate III, Figs. 4 and 5.)

Antennae ochreous-brown, banded above with fuscous, basal segment fuscous-brown above; palpi brownish-ochreous, darker on outer side, a few large bristles on outer side of median segment; head tufted above with ochreous-brown hairs, smooth-scaled in front, ochreous; back of head, thorax, and patagia, dark fuscous-brown; forewings fuscous-brown mixed with a few ochreous scales, an ochreous spot on dorsum near base, another at end of fold, cilia brownish-ochreous; hindwings pale brownish-ochreous, darker at apex, cilia ochreous. Male with a whitish-ochreous hair-pencil on upper side in a fold along vein eight. Fore and median legs ochreous-brown, paler at apex of tibia and tarsal segments; hind legs ochreous, tibiae rough-haired; abdomen ochreous. Forewings up-turned at apex as in *Ereunetis*. 18-20 mm. with wings spread.

This moth is very abundant on the windward side of Hawaii. It is not included in the Fauna Hawaiiensis, which would indicate that it was very rare when Dr. Perkins was collecting and has since become numerous, or else that it is a recent introduction which has now become very numerous. It does not answer to any description in literature available, hence I have described it as new.

The larvae are often numerous in dead cane, especially those which are rotting on account of having been badly bored by the cane borer (*Sphenophorus obscurus*); and shoots which have been killed by "iliau," or have died from being smothered, or any other cause. I have not known of their causing the death of the cane, but their appearance comes after the beginning of decomposition. They may sometimes eat the lower eyes of cane where there is a lot of wet trash at base of cane. They prefer wet situations, and for this reason they have not been observed in the sugar plantations of Oahu. They occur on this island, however, as I have collected the moths at Wahiawa, and found the larvae in rotten logs. On Hawaii, I have found the larvae in the stipes of dead fronds of tree ferns; and the moths came numerously to lights, when I staid over night once at Waimea.

The full-grown larva (Plate III, Fig. 5) is about 20 mm. long; of a dirty whitish color; head and cervical shield blackish-brown, large blackish-brown chitinized plates enclosing tubercles of segments 3 and 4; tubercles of other segments fuscous with black center at base of hair except those of iiib series; tubercle ii directly behind i so that they form two straight longitudinal lines down the back; iiia and iiib wide apart, iiib just over spiracle, iiia farther forward; iv just behind spiracle and continguous to it; v below iiia; hairs dark brown; spiracles black; surface of body covered with minute black pubescence.

The cocoon is like *O. aurisquamosa*. The pupa is quite similar, but a little larger and does not have the two conical projections ventrally on the cremaster.

## *Opogona saccharella* n. sp.

Head metallic fuscous above, pale fawn below. Palpi pale fawn, fuscous externally. Antennae pale fawn, basal segment fuscous above. Thorax dark bronzy fuscous, sulphur-yellow posteriorly. Abdomen and legs pale metallic fawn. Forewings very long-pointed, sulphur-yellow; a dark fuscous streak along basal sixth of costa; a very oblique black postmedian line from about ¾ of costa to a little before end of fold, area beyond this metallic fawn with a few violet scales; cilia pale fawn. Hindwings and cilia pale metallic fawn. 12 mm.

Near *O.* (*Lozostoma*) *protodoxa* Meyr., which is common in Australia.

One specimen, British New Guinea (Muir). The larva feeds in sugar cane similarly to what *O. aurisquamosa* does in Hawaii.

## *Opogona fumiceps* Felder.

Felder, Reis. Nov. Pl. CXXXIX, Fig. 8.

Meyrick, Journal Bombay, Nat. Hist. Soc., XVII, p. 986, 1907.

"Male and female, 12-18 mm. Head dark fuscous, face bronzy-white. Palpi whitish. Antennae ochreous-whitish, basal and next two or three joints dark fuscous. Thorax yellow, anterior third dark fuscous. Abdomen pale grey or greyish-ochreous. Forewings elongate-lanceolate; bright yellow; a thick dark fuscous streak along basal fifth of costa; apical half beyond an irregular line from middle of costa to beyond middle of dorsum rather dark fuscous except a triangular yellow spot on costa towards apex; small suffused dark fuscous spots beneath costa and on dorsum immediately beyond dividing line; cilia dark fuscous. Hindwings fuscous; cilia pale fuscous." [Meyrick, l. c. above.]

One female, British New Guinea (Muir). The larva feeds in sugar cane similarly to what *O. aurisquamosa* does in Hawaii.

It agrees very well with Meyrick's description, but not with Felder's figure; in fact, this figure and Meyrick's description do not exactly agree either. I have no doubt but that my specimen is *fumiceps*. It occurs in Java and Ceylon, which are some distance apart, and as it is reported as feeding on coconut palms in Java,* it might have considerable range in the Malayan and Pacific islands. As *Opogona aurisquamosa* in Hawaii feeds on palms and other plants besides sugar cane, it might not be unexpected if *fumiceps* was found to feed on both palms and sugar cane.

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* Van Deventer, Tijd. Ent., XLVII, p. 83, Pl. X, Figs. 1a, 1b, 1904.

## *The Dancing Moth.*

(Plate III, Figs. 6-8.)

This is probably a somewhat recently introduced moth and at present remains undertermined. Dr. Perkins collected it in Honolulu in 1901, but it is not included in the "MICROLEPIDOPTERA" of the "Fauna Hawaiiensis." I believe that Walsingham has had specimens for identification recently, but I have not heard the results. I am unable to place it generically from the literature available.

It is already abundant on Oahu, but I do not know whether it occurs on the other islands or not. Its larvae are often found in sugar cane associated with larvae of the bud moth, and I have sometimes found them quite numerous though never enough so to do any noticeable injury. They are also to be found on pineapples amongst dead leaves, and the dead bracts at the base of the fruit; and among dead or dying leaves of banana and *Pandanus*. The moth is often seen amongst ferns in the mountains.

The moth is smaller than those previously mentioned. With wings folded at rest it is but 4 mm. long (less than ¼ inch) and the breadth with wings spread is about 8 mm. or 5/6 inch. It is white to yellowish-white and the fore wings have more or less brownish markings, sometimes nearly all pale brown with blackish markings; hind wings paler; head and antennae white, the latter banded with black. It has the peculiar habit when first alighting upon a leaf or anything, of running around with much gyrating; hence the name.

The full-grown larva (Plate III, Fig. 8) is about 9-10 mm., cylindrical, head and following segment slightly narrower than rest of body; very dark brown, also two brownish spots on each side of segments three and four; rest of body somewhat fuscous but usually appearing blackish on account of the contents of the alimentary canal; tubercles quite conspicuously prominent, slightly darkened, hairs long, dark, those of tubercles i and ii curved forward; tubercles i and ii in a straight longitudinal line; tubercule iii just above spiracles; iv and v separate, below spiracle, v anteriorly and somewhat lower than iv.

The larva does not spin much silk for its protection, and does not make a cocoon for pupation. The pupa (Plate III, Fig. 7) is formed in an irregular network of silk, made on the inner side of the leaf-sheath where the larva has lived. It is 3.5 mm. long by a little over 1 mm. wide (about 1/8 by 1/16 inch); medium brown, pale on ventral side; slightly flattened and widest in middle portion; wing- and antenna-cases extend to apex of sixth abdominal segment, which is nearly to extremity of body, for the first four abdominal segments are large, and the remainder are very small; spiracles raised on slender projections which widen out broadly at base; hairs conspicuous, those on the back hooked at the tip and fastened into the network of silk above it; apex of abdomen blunt, rounded, with numerous scattered straight hairs; head with two blunt protuberances between the eyes. The pupal period lasts seven to nine days. Other details of life history not yet known.

## FAMILY GELECHIADAE.

### *Autosticha pelodes* (Meyr.).

(Plate IV, Figs. 1-3.)

"Head, palpi, antennae, thorax, abdomen, and legs, whitish-ochreous, thinly sprinkled with fuscous; second joint of palpi externally densely irrorated with dark fuscous, terminal joint with a slender blackish median ring. Forewings moderately elongate, costa moderately arched, apex obtuse, hind margin obliquely rounded; whitish ochreous, somewhat suffused with ochreous, and thinly sprinkled with dark fuscous; a blackish dot at base of costa; a small blackish dot in disc before middle, a second rather obliquely beyond it on fold, and a third more conspicuous in disc beyond middle; a row of blackish dots between veins on hind margin and apical fourth of costa; cilia whitish-ochreous sprinkled with fuscous. Exp. al. 15 mm. Hindwings whitish-ochreous slightly greyish tinged; cilia whitish-ochreous." (Meyrick) [Walsingham, "Fauna Hawaiiensis," I, Pt. V, p. 487, 1907.]

This is another moth whose larva is sometimes associated with bud worms in the cane. They are much less numerous, however, and distinctly larger, and probably do no injury. I have also found the larvae in dead sticks of castor oil plant and lantana; in fibrous matter at base of palm leaves; and on dead or partially dead twigs of Araucarian pine.

The larva (Plate IV, Fig. 3) of this species is large and distinctly different from the bud worm. When full-grown it is about 20 mm. in length; cylindrical, head and two following segments narrower than rest of body; head bright reddish-brown, eyes black; cervical shield blackish-brown; segments three to six, blackish, becoming paler posteriorly; remaining segments more or less fuscous with somewhat of a purplish tinge; tubercles i, ii, and iii, large, circular, slightly convex, a dark dot at base of hairs; other tubercles smaller; hairs long, reddish; spiracles dark with pale centers, those on segments three to eleven, minute.

The pupa (Plate IV, Fig. 2) is formed in a slight cocoon of white silk where the larva has lived. It is about 7 mm. long; uniform, medium brown; antenna- and wing-cases extending to near the apex of fourth abdominal segment; on dorsum of fifth abdominal segment is a band near the base, having longitudinal striations; cremaster flattened dorsiventrally, abruptly contracted to a median spine which has a double hook at the tip fastened into the silk of the cocoon. The pupal period is thirteen to fifteen days. Other details of its life history are not known.

## FAMILY ELACHISTIDAE.

### *Batrachedra rileyi* Walsm.

(Plate III, Figs. 9, 11.)

"Head chestnut-brown; palpi widely divergent, whitish, with an oblique pale brown mark on each side near the end of the second joint, and two or three brownish spots on the sides of the apical joint. Antennae with white and fuscous annulations; the basal joint elongate, chestnut-brown. Forewings chestnut-brown, slightly shaded with fuscous towards the costal margin; a whitish-ochreous streak at the base of the dorsal margin, followed by two or three other smaller ones along the dorsal margin (in some specimens these are obsolete); above the dorsal margin are two oblique whitish-ochreous streaks, the first before the middle, the second before the anal angle. A similar streak from the costal margin immediately before the apex is outwardly margined by a streak of black scales, the apex and apical margin being also black; there is also a faint fuscous streak running downwards through the cilia below the apex. On the cell are two elongate patches of black scales, one immediately before the middle of the wing, the other halfway between this and the base. Fringes grey, with a slight yellowish tinge. Hind wings pale greyish. Hind tibiae greyish-white, outwardly fuscous; hind tarsi whitish, with a wide fuscous band followed by two fuscous spots on their outer sides. Expanse 11 mm." [Walsingham, Tr. Am. Ent. Soc., X, p. 198, 1882.]

The larvae of this tiny little moth, I have found feeding in various situations, most frequently on dead vegetable matter or refuse substances, hence, not particularly injurious. I have found them feeding beneath leaf-sheaths of dead cane, also in borered cane sticks, and in places where the leaves are dirty and sticky from having been attacked by Aphis or leaf-hoppers. I have also found them feeding in the tassels. Once I found them very numerous in sweet corn ears feeding on the "silks," inner husks, the pith, and other parts of the cob. I have also seen them in ears of field corn, eating into the kernels of corn and into the cob. Another time I observed them numerously on a large woody twining bean vine, feeding on dying leaves and ripening pods, especially where there was an accumulation of debris, webs, frass, etc., on account of infestation by mealy bugs, *Lecanium*, *Tortrix*, and *Cryptoblabes* larvae. Similarly, I have found them feeding on lantana infested by *Orthezia*, and on palm leaves infested with mealy bugs and leaf-rollers; also on dead leaves of pandanus, banana, and various other plants. On the banana, I have found them feeding in the bunch on the dead or injured fruit, and on the skin of the ripened fruit, which they have penetrated sometimes and eaten into the fruit inside.

Mr. D. T. Fullaway has reported it from cotton infested with mealy bugs. The original description of the species is from specimens bred from rotten cotton-bolls in the United States. It has been present in these Islands for a number of years no doubt, as they were found by Dr. Perkins when he first came (1892), though it is not included in the Fauna Hawaiiensis.

The other species of this genus show a variety of habits so far as these are known. Some breed in heads of Juncus[8] and sedges, catkins, and seeds of poplar and willow,[9] in plant galls[9] (though not producing them), pine needles,[10] others in webs of other larvae and of spiders;[9] and one Australian species feeds on the San Jose scale and other scale insects.[11] A Hawaiian species feeds on ferns.

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[8] Meyrick, P. L. S., N. S. W., XXII, p. 301, 303, 305, 1898.

[9] Walsingham, Tr. Am. Ent. Soc., IX, p. 199, 1882.

[10] Meyrick, Handbook of British Lepidoptera, p. 662, 1895.

[11] Froggatt, Australian Insects, p. 280.

## LIFE HISTORY.

Eggs are deposited mostly singly, occasionally two together; about .5 mm. long, roundish-ovate, flattened below where in contact with surface of object, convex above and coarsely reticulate. They hatch in a few days. The freshly hatched larvae are about 1 mm. long, pinkish with black head and cervical shield.

The full-grown larva (Plate III, Fig. 11) is about 7-8 mm., pinkish except head which is pale brown, and cervical shield which is dark brown; tubercles concolorous, ii wider apart than i, iii above spiracle, iv + v below.

The larva pupates in a whitish cocoon amongst the frass where it has fed. The pupa (Plate III, Fig. 10) is 4-5 mm. uniform, medium brown; wing-cases and antenna-cases extend to apex of sixth abdominal segment; abdominal segments apparently immovable; terminal segment with numerous slender hooked bristles, a few also on the two preceding segments. The pupal period is eleven to thirteen days.

## FAMILY PHYCITIDAE.

### *Cryptoblabes aliena* n. sp.

(Plate IV, Figs. 4-7.)

This moth with wings spread is 14-16 mm. long; grey, thickly irrorated with fuscous. Palpi grey, pale fuscous on outer side of second and third segments. Antennae pale grey. Head, thorax, and fore and mid femora with more or less crimson tinge. Abdomen pale grey brown. Forewings grey, thickly irrorated with fuscous, more or less suffusion of crimson at base, on basal half of costa, and on inner margin, also beyond the cell where it is sometimes confined to the veins; lines obsolete; sometimes a dark fuscous discal dot, and one or two dark fuscous discocellular dots; cilia grey-fuscous, darker at base. Hindwings pale and subhyaline, darker on veins, apex and hind margin; cilia whitish-grey.

The larvae of this Phycitid moth were first noticed in 1905; on sorghum, cotton, and sugar cane. In each case, the plants were considerably attacked by Aphis. On sugar cane they often hide within a retreat made by the margin of the leaf being rolled down and fastened beneath with silk. Often several larvae may be in the same place. They eat off the substance of the leaf, leaving the opposite epidermis, which makes the leaf look dead on the margin. They often feed near the base of the leaf, adjacent to the sheath.

The larvae feed on leaves of sorghum in the same way. They also feed in the tops eating the flowers, bracts, and young seeds.

In 1906, larvae were found very abundantly feeding on sweet corn, which was badly attacked by corn-hoppers (*Peregrinus maidis*). They were beneath leaf-sheaths and husks, and in the ears eating the silks, young grains and even the bracts or chaff of the cob; they were also in the tassels. They spin slight silken tunnels wherever they feed.

More recently, I have found the larvae quite abundant among the flower clusters of Algaroba, both fresh clusters, and the withered and dried up ones. I have also found them on orange, mulberry, and some other plants, feeding where there has been infestation by Aphis or mealy bugs; and in the dried capsules of the castor oil plant.

In May, 1908, I found them abundant on lantana where it was being killed by being attacked by *Orthezia*, the "Maui blight"; and in the same year found them on coffee trees amongst the berries, an occasional one being eaten by them. In all cases where these larvae occur along with Aphis, mealy bugs, etc., they do not feed on these latter insects themselves, although they may be attracted by the more or less sweetish excretions of these insects; they feed, however, largely on the tissues of the plants themselves, either the fresh tissues or else the dead or dying tissues.

It is thus seen that the larvae of this moth are quite general feeders. They are not to be considered very injurious, however; the other insects with which they are usually associated being far more injurious. They have not as yet become injurious to sugar cane; but are generally distributed, as I have occasionally observed the larvae in cane fields of various districts of the Islands.

Larva (Plate IV, Fig. 7) is about 12 mm. long; nearly cylindrical, narrowing towards each end; olivaceous, yellowish, reddish, or fuscous, with several longitudinal darker stripes, brownish or fuscous; most conspicuous is a broad, somewhat double brownish or fuscous, stripe just above line of tubercles iii; head yellowish-brown to dark fuscous, eyes black; cervical shield concolorous, darker on anterior margin; tubercles small, concolorous or pale, with a black dot in center at base of hair; tubercle iii on segments three and twelve surrounded by a darker ring; tubercles i and ii in straight longitudinal line; iii just above spiracle, iv + v below spiracle and a little more anteriorly; hairs very pale brown; spiracles pale yellow. Larvae taken from sweet corn and algaroba blossoms were paler, usually yellowish or reddish; those from lantana, orange and other trees where *Orthezia,* Aphis, mealy bugs, etc., had been feeding, were mostly very dark fuscous, often almost black, and nearly uniformly colored.

Pupa (Plate IV, Fig. 6) is 5-6 mm. long; bright light brown, paler below, greenish on wing- and leg-cases; punctured all over the back; fine hairs in two dorsal, two lateral, and two ventral rows; spiracles slightly raised; wing- and leg-cases extend to near apex of fourth abdominal segment; cremaster with two stout straight spines close together, touching, hooked at tip, firmly fastened into silk of cocoon, a few short hooked spines near their base. Formed in a slight cocoon amongst the web where the larva fed.

I have bred no parasites from the larvae; nor have I ever found any of them stored up for food in wasps' nests. Specimens of the moth were sent to Dr. Dyar, Washington, D. C., for determination. He informed me that they did not agree with any described species; hence, I have described it as new.

## NATURAL ENEMIES.

### PARASITES.

I have bred two parasites attacking the caterpillars of the bud moth, to some extent, in the cane of the Experiment Station grounds.

## FAMILY BETHYLIDAE.

### *Sierola molokaiensis* Ashm.

(Plate II, Fig. 13.)

"Female. Length 2 to 3.5 mm. Black, the head and thorax finely coriaceous but more or less shining; mandibles black or brown-black; abdomen smooth, impunctate, highly polished; antennae, except the four or five terminal joints, and the legs, except the front coxae and more or less of the front femora or at least above, testaceous or brownish-yellow; front coxae and front femora black or dark brown in part, the latter sometimes brownish only above or outwardly; wings hyaline, the parastigma and the stigma brown or fuscous, the other veins pallid or pale yellowish.

"The head is distinctly longer than wide, with an acute ridge anteriorly between the insertion of the antennae, and clothed with a short, sparse pubescence. The antennae are much longer than the head, all the joints of the flagellum being distinctly longer than thick or from 1½ to 2 times as long as thick.

"Male. Length about 2 mm. Black; two or three basal joints of the antennae and the legs, flavo-testaceous, the rest of the antennae being dark fuscous or black. The anterior femora above or outwardly and sometimes the front coxae, more or less, are brown or fuscous. The joints of the antennae 5 to 6 are oval and very little longer than thick, joints 11 and 12 being moniliform, while the abdomen is oblong-oval, not longer than the thorax." [Ashmead, Fauna Hawaiiensis, I, Pt. III, p. 290, 1901.]

Of a lot of cocoons of the bud worm collected in March, 1908, 33⅓% were infested with this little Bethylid. Some contained the *Sierola* larvae feeding upon the bud worm; and one contained adult Sierolas which were all ready to emerge. The number per cocoon varied from two to eight. The larvae feed externally on the bud worm. Probably the adult *Sierola* stings the caterpillar after it has made its cocoon, paralyzes it and lays eggs in or upon it. The larvae get their growth in a few days (as with other parasites which feed upon paralyzed caterpillars). They are plump footless maggots, somewhat curved, nearly transparent, with numerous white dots in their body-wall. When full-grown they are about 3 mm. long. They then spin loose brownish cocoons occupying all the space inside the cocoon of the bud worm. The pupa stage is passed through in about a week.

The parasite breeds more rapidly than the bud worm. It should eventually be a valuable parasite on the bud worm. I first bred one from cane bud worm in May, 1906, and at the time there was some doubt as to whether it was really from the bud worm or not. I have made no observations on it again till recently, though I have occasionally taken a specimen in cane, and have occasionally found bud worms parasitized by it.

## FAMILY EULOPHIDAE.

### *Melittobia hawaiiensis* Perkins.

(Plate IV, Figs. 8-10.)

"Black, or brownish-black, the thorax with a faint aeneous reflection, the head and thorax also faintly metallic. The mandibles are reddish and the scape of the antennae is more or less pale, sometimes clear yellow, at other times only more or less obscurely brown in dried specimens. The tibiae and tarsi are yellow, the femora dark, or at least more or less sordid. In fresh specimens the ocelli are enclosed in a pale ring, and the eyes pale-margined, while there is a pale median line on the face, furcate above and below, forming an elongate X-like mark. The mesothoracic sutures are mostly pale, as also the parapsidal furrows and the scutellar grooves. In dry specimens generally all these pale markings disappear. Head convex in front in fresh examples, but collapsing altogether in dry ones; the antennae with elongate scape, widening to the apex, and about as long as the pedicel and funicle joints together, the pedicel obconical and longer than the first funicle joint, the latter not differing much from the two following, and transverse on their widest faces, the club ovate, twice as long as its greatest width, about equal to the three funicle joints together, and with a spine at the apex. Thorax with very short hairs and very minutely punctured, the propodeum smooth and shining and with a median groove. Abdomen usually subparallel-sided in dry specimens and elongate, being about as long as the head and thorax together or rather more. Length rather more than 1 mm. Wings evenly dotted with short hairs and with short marginal fringe; the marginal vein with two rows of long and some shorter setae.

"Male quite unlike the female, blind and with very different antennae, which are 9, not 8-jointed. Color, yellow or brown, sometimes more or less darker in parts, the apical joints of the antennae more or less black. Scape very large, subtriangular, and about as long as all the other antennal joints together; it is concave beneath and some of the following joints are usually withdrawn into the concavity, which is partly closed by the incurved sides, pedicel laminate and often entirely hidden beneath the scape, first funicle joint triangular, very narrow at the base, second and third not differing much from one another, both being wide, fourth very short and transverse, club three-jointed, the funicle joints are set with longish setae. Wings rudimentary, the front pair about as long as the thorax, the marginal vein very long, reaching nearly from base to apex and clothed with many long bristles." [Perkins, Proceedings Hawaiian Entomological Society, I, Pt. 4, p. 124, 1907.]

This little Chalcid was discovered by Mr. Giffard in 1907, bred from larva of some wasp or bee in its nest in decayed branch of tree.* In the latter part of the same year, I found several nests of the leaf-cutter bee (*Megachile palmarum*) in which most of the cells had been parasitized by this Chalcid. I have also reared them in the laboratory upon larvae of three different wasps: *Odynerous nigripennis, Pison hospes,* and *Sceliphron caementarium.* In March, 1908, I first discovered them breeding on the larvae of the bud worm (*Ereunetis flavistriata* Wlsm.) in sugar cane at the Experiment Station. Of a lot of fifty cocoons of the bud worm, collected at one time, six, or twelve per cent., contained a bud worm parasitized by *Melittobia.* Five of them had eggs of *Melittobia* (seven, nine, eleven, twenty, and thirty respectively per bud worm) scattered on the surface, which were allowed to hatch, and reared to maturity. The sixth cocoon contained thirty-five pupae of *Melittobia* which had consumed a bud worm within its cocoon, and were lying in contact with its dried up remains.

Apparently the female *Melittobia* enters the bud worm's cocoon before it is entirely completed, stings the worm and deposits eggs upon her. Or it may be that after entering the cocoon, she waits till the bud worm is assuming the inactive condition previous to the transformation to pupa, and then deposits her eggs upon her; either stinging the bud worm to prevent further transformation, or else the young larvae hatch and begin eating so quickly that further transformation is prevented.

The egg is white, cylindrical, slightly curved, ends rounded, 0.3 mm. long by 0.12 mm. wide. They are laid indiscriminately on the surface of host, singly or several together.

They hatch very quickly and the young larvae feed externally upon the bud worm, becoming full-grown in about a week. They are footless grubs just a little more than 1 mm. in length, and transform to pupae in two or three days. They rest in the pupa stage about two weeks. So many of this parasite develop upon one host, that it should be a very valuable parasite upon the bud worm. I have not as yet ascertained whether it is generally distributed throughout the islands or not. The known hosts of this parasite now include *Megachile*, *Sceliphron*, *Pison*, *Odynerus*, of Hymenoptera, and *Ereunetis* of Lepidoptera.

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* Proc. Haw. Ent. Soc., I, Part 4, p. 121. 1907.

Recent observations show that this parasite confines its attacks mostly to the hymenopterous hosts, especially *Sceliphron* (the mud-dauber wasp so abundant everywhere), and bud worms are not much attacked by them. When breeding on the larva of *Sceliphron*, several hundred larvae of this parasite attain their growth on one larva of the host; I once counted 338 (331 females and 7 males) parasites bred from one larva of *Megachile palmarum*. The preponderance of females is always apparent. In a lot of adults reared from several larvae of *Sceliphron* were 1492 females and 48 males: about 1 male to 31 females. Whether this species is partially parthenogenetic I have not as yet proved.

## FAMILY BRACONIDAE.

### *Microdus hawaiicola* Ashm.

"Female. Length 3 to 4 mm.; ovipositor fully as long as the body. Polished black, with the metathorax rugoso-punctate, the first segment of the abdomen being longitudinally striate, the second with a few striae only, a little beyond its middle; the first two joints of the antennae, the clypeus, the cheek, the mandibles, the legs, except as noted below, and ventral abdominal segments 1 to 4, honey-yellow, or brownish-yellow; the palpi, tegulae, trochanters, more or less, and a narrow annulus at base of tibiae, yellowish-white; the hind coxae, except at apex, are black; the middle femora and hind tibiae and tarsi are brown or fuscous, while the hind femora vary from dark fuscous to black. Wings subhyaline; the stigma and the veins, except toward the base of the wings, are brown, the areolet being small, triangular and longly petiolate, the second discoidal cell being open at apex.

"The abdomen is black; the ventral segments 1 to 4 pale, the third and beyond, usually with dusky spots, while the extreme lateral margins of the second segment are yellowish-white." [Ashmead, Fauna Hawaiiensis, I, Pt. III, p. 361, 1901.]

This small black Braconid occurs on the four main islands of the group. I have collected it in cane fields, and once bred a specimen from a bud worm (*Ereunetis flavistriata*) which was amongst bananas on the bunch. It no doubt parasitizes this species to some slight extent. I have also reared it from *Batrachedra rileyi* on a few occasions; and from a Gelechiid (*Stoeberhinus testaceous*) which is very common, the larva feeding amongst dead leaves at base of Bermuda grass and probably other grasses. Dr. Perkins informs me that he has bred this Bracon from many Tineids, especially *Ereunetis simulans.*

The larva of this parasite emerges from the host caterpillar after the latter has spun its cocoon and is about ready to pupate; then finishes eating the caterpillar and makes its own white silken cocoon inside the cocoon of its host. The adult parasite emerges in about two weeks.

I once reared several of these parasites from larvae of *Batrachedra rileyi* found stored in the nest of a wasp (*Odynerus montanus*). The wasp had collected parasitized larvae and stored them up without injuring the parasitic larva inside while stinging to paralyze the *Batrachedra* larva. These parasite larvae then emerged from the latter, after I had examined the wasp's nest; spun their cocoons and developed to maturity.

## ANTS.

### *Pheidole megacephala* Fab.

This species of ant is the common medium sized red ant. It is always abundant in cane, often having its nests beneath the leaf-sheaths. It destroys more or less of the young bud worms, also larvae of the other moths which are treated of here.

## WASPS.

### *Odynerus* Species.

There are over one hundred species of native wasps of this genus. They all prey upon the larvae of Lepidoptera, storing them in their nests for the young wasps to feed on. Several species have been observed in cane fields hunting for bud worms and other Tineid larvae. On Kauai, *O. blackburni;* on Oahu, *O. montanus* and *O. dubiosus;* on Maui, *O. sandwichensis, O. insulicola,* and *O. konanus.* They are small wasps, mostly black in color, but some have red markings and others yellow.

The nests of these wasps are mostly in cavities of lava rocks; hence, the reason they are so often seen around walls and heaps of stones. Enough caterpillars are placed in a cavity (after having been stung and paralyzed by the wasp) to provide food for one wasp larva; an egg is suspended from one side by a slender filament; then the opening is sealed with mud. The young larva soon eats the caterpillars, then spins a cocoon in which transformation to the adult stage takes place.

## GENERAL REMARKS.

The bud worm is not usually considered a serious enough pest to demand any special attention; in fact, its work on the cane is not generally known or understood. The patches eaten by them from the rind have often been ascribed to cockroaches; and the eating of "eyes," to various other insects. Also their work on the inner side of the leaf-sheath is similar to the way the adult cane borer eats in the same place, and the work of one is likely to be mistaken for that of the other. On the other hand, on account of the presence of one or more of the various lepidopterous larvae, treated of in this paper, in dead or diseased cane, they have often been held responsible for the injury.

In this paper, an attempt has been made to point out the true habits of these insects, so that when found in cane, it can be readily ascertained whether harmful or not. By comparing any larvae found, with the illustrations, the species may be determined, then by referring to the text the known habits may be ascertained, and one will know whether to expect injury from them or not. All of the smaller lepidoptera which are known at present to feed on cane, dead or diseased, are included. As has been pointed out, the majority of them are not injurious. For those that do really eat out the "eyes" of cane to some extent, there appears to be no practical remedy, nor is the injury by them sufficient to warrant any extensive operations against them. Clean and thorough stripping, however, makes conditions less favorable for them, for the accumulation of dead leaves and trash usually present in a cane field, is just the sort of condition most acceptable to them. No doubt it would be found in fields of young ratoons intended to be cut purposely for "seed" that to keep well stripped would result in less damage being done, i. e., fewer "eyes" being eaten out; for the eating of the "eyes" is done before the leaf is removed from the cane, while the bud worm has it to hide behind.

Careful inspection of "seed" from such places should be made to avoid the planting of cuttings having one or more "eyes" destroyed.

## EXPLANATION OF PLATES.

### PLATE I.

Figure 1.—View of the inside of a sugar cane leaf-sheath, the darkened streaks showing where bud worms have eaten away the substance between fibers. Some cocoons and caterpillars also shown.

Figure 2.—A portion of cane stick showing the buds destroyed; and the darkened areas the characteristic manner in which the bud worm eats off the surface of the rind.

Figure 3.—Cocoon of bud worm covered with fibers from cane leaf.

Figure 4.—Cocoon of bud worm covered with frass, empty pupa case protruding.

BULLETIN 6

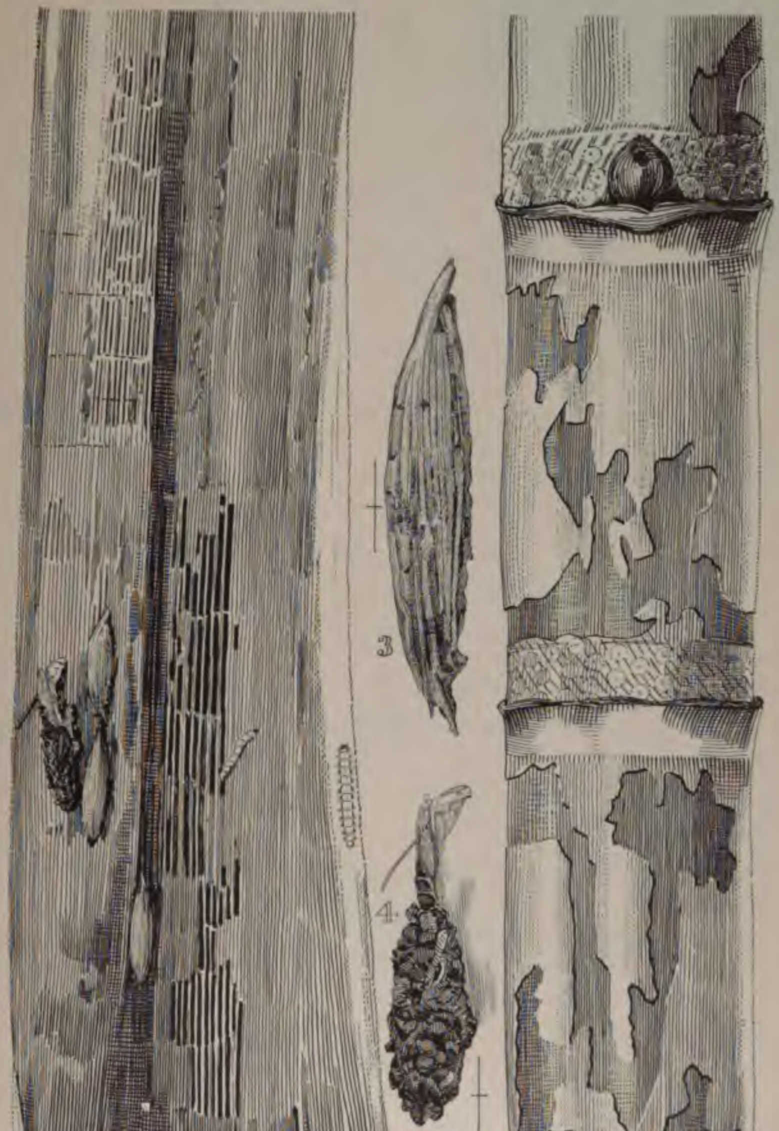

PLATE I.

## PLATE II.

Figure 1.—*Ereunctis flavistriata.*
Figure 2.— “ showing position at rest.
Figure 3.— “ egg on surface of leaf-sheath.
Figure 4.— “ caterpillar.
Figure 5.— “ head and anterior segments of caterpillar.
Figure 6.— “ pupa.
Figure 7.—*Ereunctis minuscula.*
Figure 8.— “ anterior portion of caterpillar.
Figure 9.— “ apex of pupa.
Figure 10.—*Ereunctis simulans.*
Figure 11.— “ anterior portion of caterpillar.
Figure 12.— “ pupa.
Figure 13.—*Sierola molokaiensis.*

BULLETIN 6

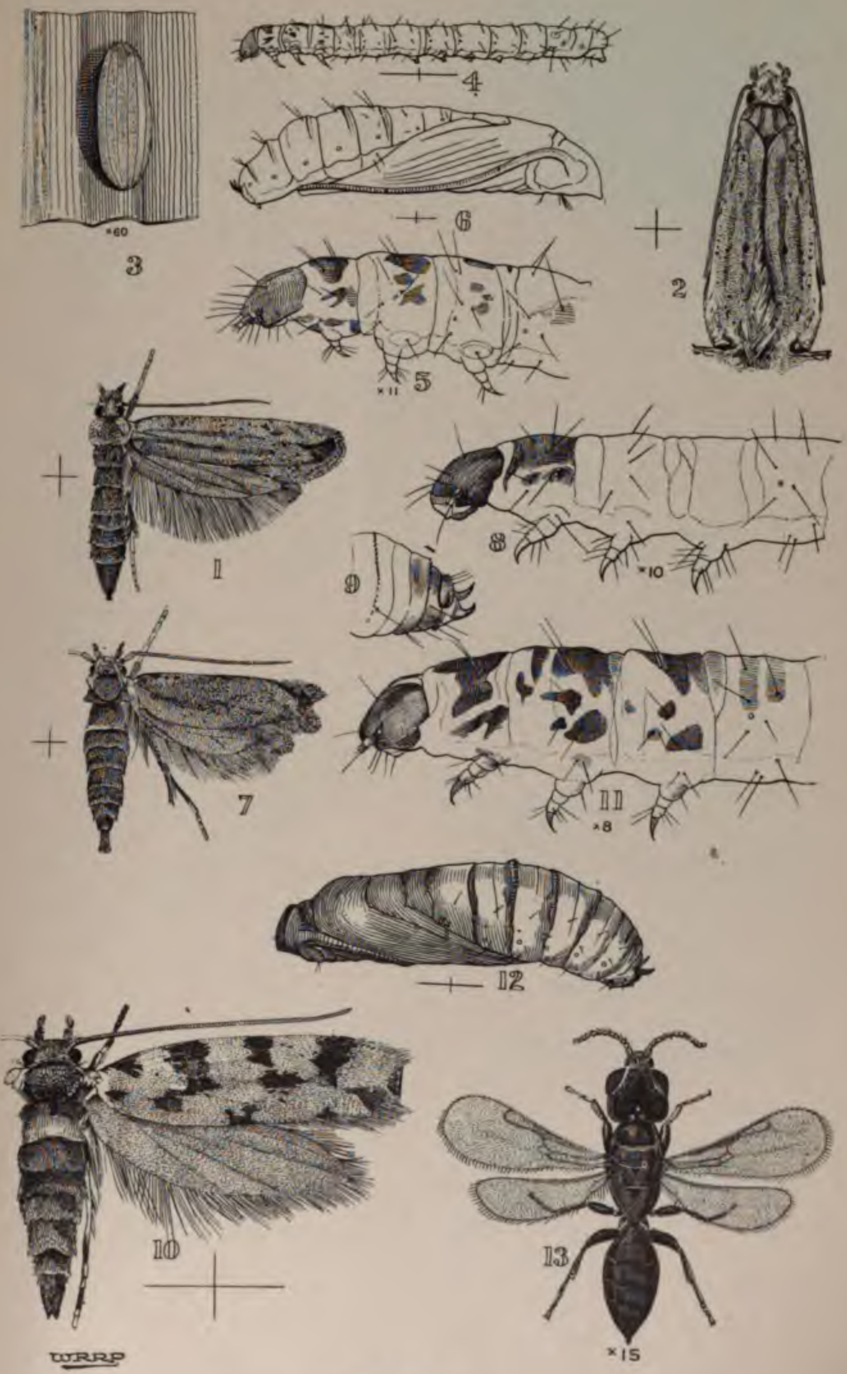

PLATE II.

## PART III.

Figure 1.—*Opogona aurisquamosa.*
Figure 2.— " pupa.
Figure 3.— " anterior portion of caterpillar.
Figure 4.—*Opogona apicalis.*
Figure 5.— " anterior portion of caterpillar.
Figure 6.—Dancing Moth.
Figure 7.— " pupa.
Figure 8.— " anterior portion of caterpillar.
Figure 9.—*Batrachedra rileyi.*
Figure 10.— " pupa.
Figure 11.— " anterior portion of caterpillar.

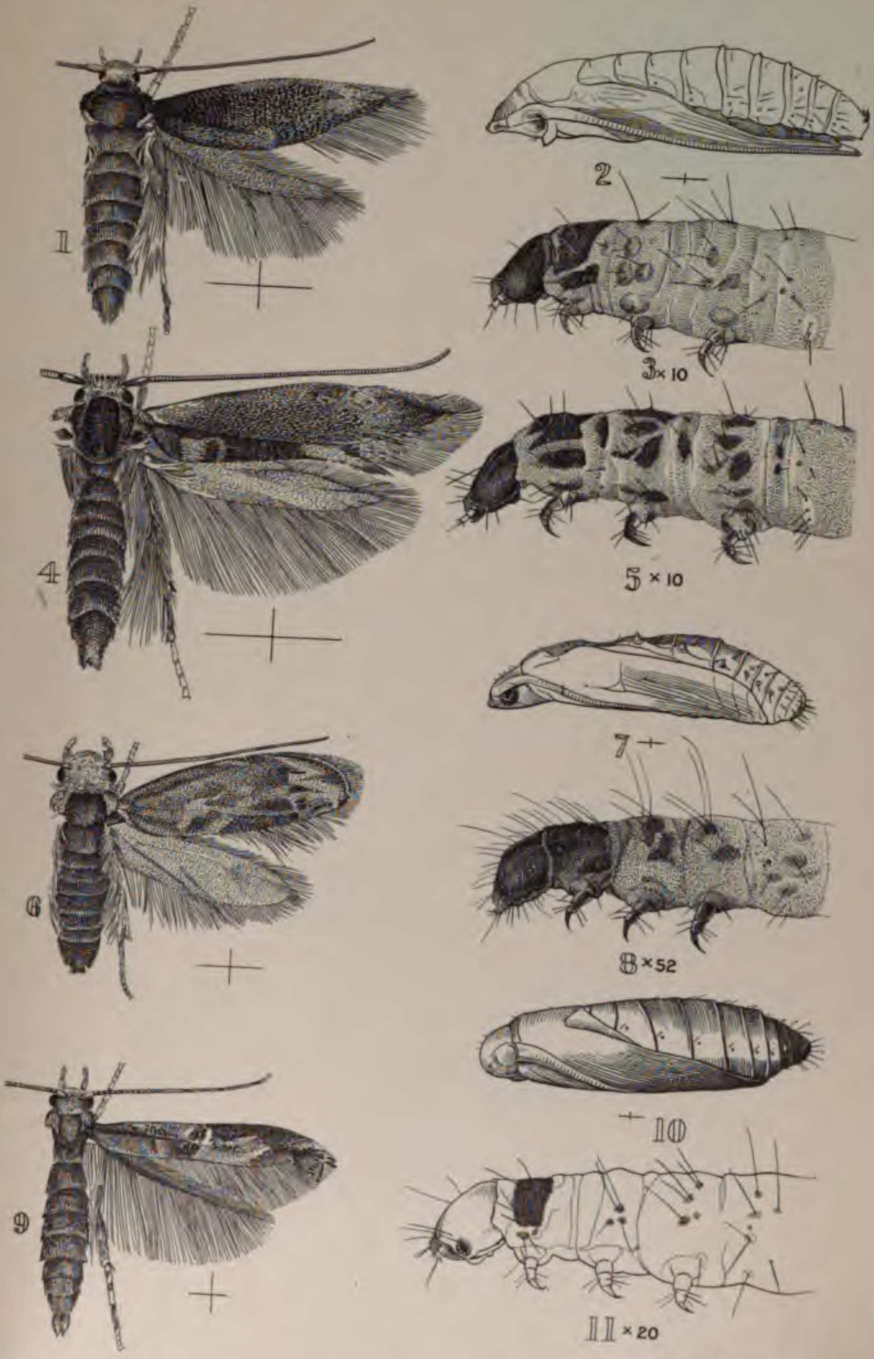

PLATE III.

## PLATE IV.

| | | |
|---|---|---|
| Figure 1.— | *Autosticha pelodes.* | |
| Figure 2.— | " | apical segments of pupa. |
| Figure 3.— | " | anterior portion of caterpillar. |
| Figure 4.— | *Cryptoblabes aliena.* | |
| Figure 5.— | " | showing antennal hook of male. |
| Figure 6.— | " | pupa. |
| Figure 7.— | " | anterior portion of caterpillar. |
| Figure 8.— | *Melittobia hawaiiensis,* | female |
| Figure 9.— | " | male. |
| Figure 10.— | " | ventral view of male antenna. |

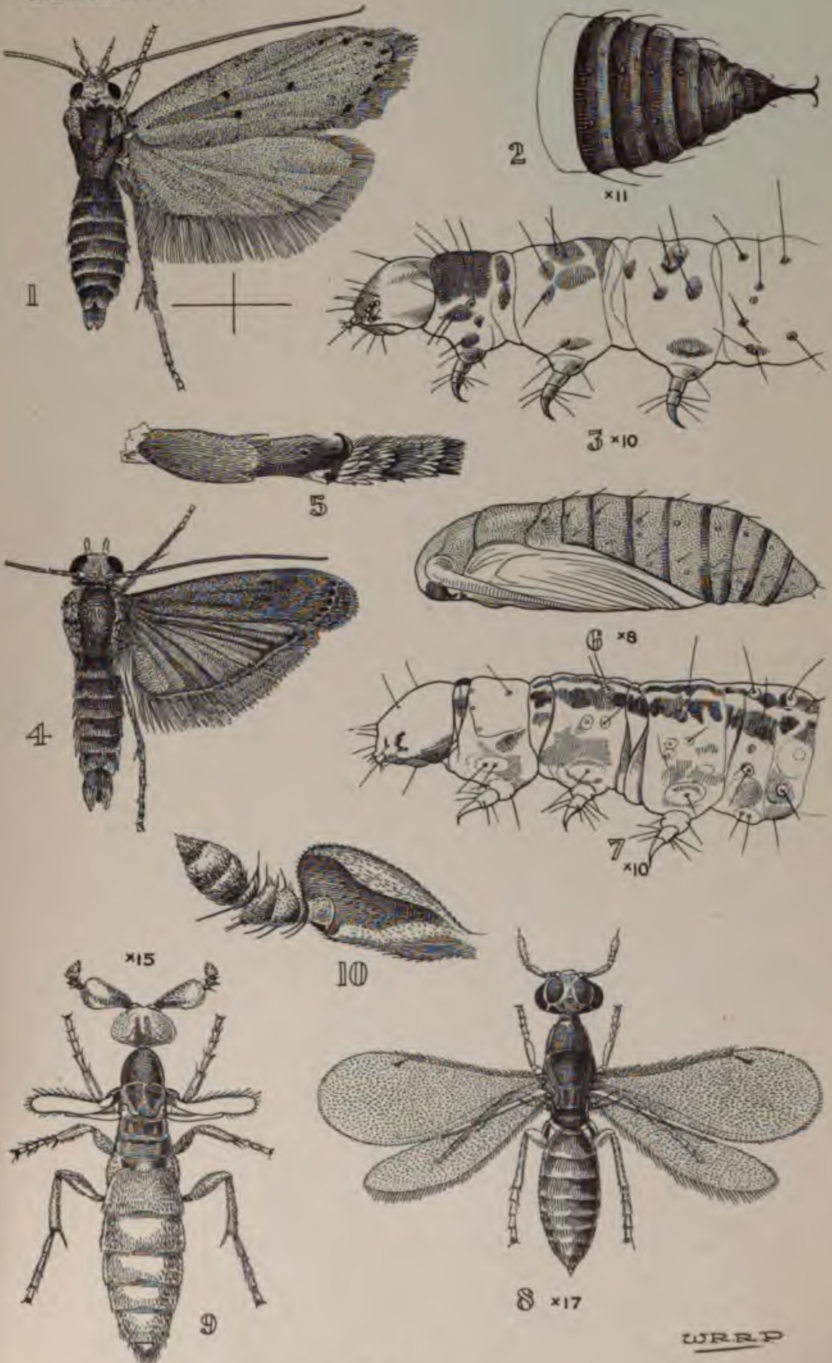

PLATE IV.

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DIVISION OF ENTOMOLOGY

BULLETIN No. 7

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

# Army Worms and Cut Worms On Sugar Cane in the Hawaiian Islands

By O. H. SWEZEY

HONOLULU, HAWAII
NOVEMBER, 1909

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NOVEMBER, 1909

# LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the Hawaiian Sugar Planters' Association, Honolulu, Hawaii.

Gentlemen:—I herewith submit Bulletin VII of the Division of Entomology. It has been prepared by Mr. Otto H. Swezey, and is entitled "Army Worms and Cutworms on Sugar Cane in the Hawaiian Islands."

Yours obediently,

G. W. KIRKALDY,
Acting Director, Division of Entomology.

Honolulu, Hawaii, September 1, 1909.

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# INTRODUCTION.

There are 35 or more species of cut worms and army worms known in the Hawaiian Islands. Of these, the majority are native and live mostly in the mountains or high plains. Only four of the native species (*Cirphis amblycasis, Cirphis pyrrhias, Feltia dislocata* and *Agrotis crinigera*) have so far become pests in cane fields. The other native species have apparently been kept in check by their parasites and other enemies, or remain at higher elevations than canefields. Some species are quite rare, but others sometimes become abundant locally.

Besides the four native species mentioned above, the other species treated of in this circular are cosmopolitan, occurring in most of the warmer parts of the globe. They are pests, wherever known. The army worm (*Cirphis unipuncta*) is undoubtedly the worst one of them, in the cane fields here. But usually to be found amongst these are one or more of the species above mentioned, though these latter usually are not nearly so numerous as the former, and probably the most of the injury to the cane is done by the army worm.

From reports of devastation done by these caterpillars in previous years, apparently they are not nearly so serious a pest at present, though I have seen, during the past three years, fields of young cane very badly stripped by them, and hence kept back for a while at the beginning, when it was desirable for it to be getting a good start. The critical time for the cane is when it first comes up. If the army worms are numerous, they will probably eat the leaves from the young shoots as fast as they appear. Since the growing heart of the cane-shoot is within, and lower down than where they attack it, the shoot is not killed outright, as would be a tomato, cabbage or tobacco plant if cut off at the surface of the ground; hence, their work in cane fields is not so disastrous as in many other crops. The young shoots of cane, although temporarily checked, eventually reach a growth beyond the attack of the caterpillars, higher than they will climb.

The various species of caterpillars may be readily identified by comparing them with the figures on the plates, likewise the moths, more satisfactorily than from descriptions.

## THE ARMY WORM.

*Cirphis unipuncta* (Haworth).

(Plate III, Figs. 3-6.)

*Leucania unipuncta*, Meyrick, Fauna Hawaiiensis, I, Pt. III, p. 142, 1901.

*Heliophila unipuncta*, Dyar, List of North American Lepidoptera, p. 161, 1902.

*Cirphis unipuncta*, Hampson, Cat. Lep. Phal. British Mus., V, p. 547, 1905.

"The moth is variable in size, the average individual measuring about 40 mm. (an inch and a half) in wing expanse. The front wings are pointed at the tips, and are of a reddish grey or fawn color, much specked with black atoms. Anterior of the center of each wing are two rather large, indistinct spots, distinguished from the rest of the wing by an absence of black specks, and by a clearer reddish coloring. Immediately posterior to the outermost of these spots is a white point indistinctly surrounded by blackish. A series of black points parallel with the outer margin; one on each vein is usually perceptible. An oblique black streak starts from this line of dots, and ascends to the apex of the wing, and, with the form of the wings, principally characterizes the species. Just inside the fringe is a serious of black dots, one between each two veins. The hind wings are translucent, grey, with the terminal border and the nervures blackish (in the front wings the nervures are whitish). The sexes differ from each other but little.

"The under side of the wings is of an opalescent yellowish white. Along the outer margin, particularly of the hind wings, are many black specks, so nearly confluent as to form a definitely limited dusky terminal band. On the costal margin of each forewing, near the tip, is a small, distinct, black dot, and at the center of each hind wing is a similar dot. The body is concolorous with the wings, and the legs are light grey, slightly tinged with reddish, and speckled with black dots." [Riley, Third Report of the U. S. Entomological Commission, p. 103, 1883].

Neither in this description, nor in any other of the numerous descriptions I have seen of this species, is mention made of the tuft of long hairs which occurs on each side of the abdomen of male, at base. I sent specimens to Dr. Dyar, who verified my identification of the species, and replied that the structure of the male tufts was the same as in North American specimens. Apparently these tufts were overlooked by Hampson, for in his arrangement of the species of *Cirphis*, he places *unipuncta* amongst those not having these tufts of hair in the male.

This insect occurs as a pest in many widely separated parts of the globe. In the United States it is a bad pest on corn and other cereals. It ranges from Canada south to all southern parts of North America, West Indies, and then South America to Argentina and Chile. It occurs in Madeira, Azores, Britain and South Europe; Southeastern Siberia, Japan, China, India, Malay Islands, Australia, and New Zealand. It has sporadic outbreaks, when it is extremely destructive to grass and farm crops devastating whole fields and travelling in army-like migrations to others adjacent. Fortunately there are numerous parasites, which keep it in check for most of the time; but for unexplained reasons there are times when they increase beyond the control of parasites and predators, and are temporarily very destructive, until again checked by the increase of the parasites.

In these islands, they usually occur in the lowlands and grassy regions; and when abundant in sugar cane fields it is those fields which adjoin fields of grass, or which have more or less grassy gulches in them, or in fields which have been recently planted on land that had lain fallow and had grown up with grass and weeds, or had been in pasture for a time. Although the moths breed more or less the year round, they are more prolific, or breed more favorably during the so-called winter months, November to April. In many districts there is more rain during these months and growths of grass occur favorable for the feeding of the caterpillars. At this time of the year, in fields of young cane situated as above designated, they often are present in sufficient numbers to severely check the growth of the cane. They, in connection with other cut worms, sometimes strip the leaves of the cane, leaving nothing but midribs. This may be only in certain parts of the field, or it may be over a considerable area of it. As the caterpillars feed for about three weeks or a month, while getting their growth, the cane will be checked for this length of time; but after the caterpillars of one brood have become full-grown and cease feeding, there will be a period of a few weeks before the next brood, so that the cane will have a chance of recovery, and the larger it gets the better is it able to withstand further attacks.

## LIFE HISTORY AND HABITS.

The egg of the army worm is spherical, smooth, white, and opaque when first laid, becoming faintly iridescent and more sordid before hatching. Its average diameter is 0.6 mm. The eggs are usually placed at the base of the leaves or thrust in behind the leaf sheath, but may often be deposited amongst trash or debris as well. The eggs are glued on to the objects, wherever they are deposited, and are commonly in rows of 15 to 20; but sometimes they are as few as 2 or 3, and again as many as nearly a hundred may be in one batch. The moths deposit their eggs in the early part of the night, even before dark sometimes. One female may deposit several hundred eggs (500-700) and may occupy two or more evenings so doing.

The eggs hatch in a week or ten days, depending on the temperature. The young caterpillars first crawl by a looping motion on account of the fact that the first and the second pairs of abdominal prolegs are rudimentary. After the first molt only the first pair are rudimentary, and after the second molt all prolegs are functional and the caterpillar crawls in the normal manner. There are five molts at intervals of three to six days, and the growing period is thus about three to four weeks, depending on the temperature. The caterpillars usually feed on the plants at night-time and hide during the day beneath leaves or trash on the surface of the ground, or in the soil a little below the surface, or sometimes even remain on the plant and feed more or less or hide in a fold of leaf or behind a leaf sheath or other convenient place. Those feeding on the leaves in the daytime drop to the ground on the slightest disturbance and coil up, remaining motionless for a time. The feeding of the army worm is not like some of the cutworms in that it feeds on the leaves instead of eating the stem of a plant and thus cutting it off at or near the surface of the ground. The evidences of their feeding on sugar cane are easily detected; the lower leaves of the young cane-shoots being notched and ragged where they have eaten the blade of the leaf, and when numerous, in fact the blades of the leaves entirely eaten away, leaving nothing but the hard midribs.

The full-grown caterpillar (Plate III, fig. 4) is 35-40 mm. long, or about one and one-half inches. General color greenish brown with longitudinal blackish stripes on back and sides, much paler below. The stripes are as follows: a wide, pale blackish stripe on the back with an interrupted white line in the middle; outside of this is a narrow pinkish brown stripe; then next a still wider blackish stripe darker along its lower edge, which contains the black oval spiracles, or breathing pores; below this is another pinkish brown stripe having whitish lines on each edge. The head is pale brown, each lobe with a network of darker brown and running up and down in front are two blackish bands diverging below. First segment behind head nearly all brown dorsally. A dark brown spot on outer side of each proleg. Hairs small, situated in inconspicuous tubercles.

The coloration varies somewhat and the stripes are sometimes less distinct. The younger stages are colored about the same; often paler, and sometimes nearly black.

When full-grown, the caterpillar burrows into the soil and at a depth of two to four inches constructs an oval earthen cell, within which after a few days it transforms to the pupa (Plate III, fig. 5). The pupa is of a shiny dark brown color, about 18 mm. long and 4.5 mm. thick, rounded at anterior end and tapering posteriorly to a blunt point which is armed with two nearly straight parallel spines, hooked at the tip, and placed near together. There are four other slender hooked bristles, one lateral and another a little dorsal of each of the larger spines (Plate III, fig. 6). The wing-cases terminate roundedly at the apex of the fourth abdominal segment. On the bases of abdominal segments 5, 6 and 7 is a dorsal black line containing a row of 12-20 pits. These segments are movable.

The moth emerges from the pupa in about ten days to two weeks. It makes its way above the surface, and, clinging to some object, its soft wings soon become expanded and dried, and the moth is fully matured, after a period of from six to eight weeks, or sometimes more, according to temperature.

## *Cirphis amblycasis* (Meyrick).

*Leucania amblycasis*, Meyrick, Fauna Hawaiiensis, I, Pt. III, p. 141, 1901.

*Cirphis amblycasis*, Hampson, Cat. Lep. Phal. British Mus., V, p. 495, Pl. XCI, fig. 30, 1905.

"Male and female; 38-41 mm. Head and thorax whitish-ochreous, somewhat brownish-tinged, thorax posteriorly with a few blackish specks. Abdomen in male with very long dense expansible pale ochreous lateral tuft attached to a broad spoon-shaped chitinous process rising from basal cavities, and dense yellowish expansible tufts in middle of base beneath. Forewings pale brownish-ochreous, indistinctly strigulated with fuscous or grey; dark fuscous dots near base in middle and on costa, indicating subbasal line; first and second lines indicated by series of dark fuscous dots, second partially double, moderately curved; lower edge of reniform forming a white dot, edged with dark fuscous and followed by a small dark fuscous suffusion; in female orbicular and reniform obscurely defined, pale yellowish-ochreous; a wedge-snaped faint darker suffusion on termen beneath apex, not reaching second line. Hindwings light greyish-ochreous, irregularly suffused with fuscous, becoming darker fuscous posteriorly." [Meyrick, Fauna Hawaiiensis I. Pt. III, p. 141, 1901].

I have usually found the caterpillars of this moth feeding on various grasses of the lower lands; but I have also found a few of them along with *C. unipuncta* and other caterpillars in the higher cane fields of the sugar plantations of the Hamakua and Hilo districts of Hawaii. I have never found them numerous enough of themselves to be injurious.

It is a native species and the moth closely resembles *unipuncta*. It differs however in being a little larger and the body more plump; has a faint reddish tinge, and the forewings lack the fuscous line which *unipuncta* has, extending obliquely inward at apex. The caterpillar, also, is a little larger than that of *unipuncta*.

The full-grown caterpillar is about 38 mm. It is usually cream colored with pale brownish mottlings; a more or less distinct fuscous mid-dorsal stripe, pale-centered; a wide dark fuscous sub-dorsal stripe, concave on upper edge in each segment, connected by transverse bar on segment 12; a wide supraspiracular stripe of fuscous mottlings, below this a pale yellowish line; prolegs with dark fuscous spot on outer side; head very pale brownish with minute fuscous reticulation, vertical fuscous spot in middle of paraclypeus, a wide fuscous border to inner edge of each cranial lobe; eyes black, a fuscous line extends upwards, and another obliquely backward from them; cervical shield much spotted with dark fuscous, traversed by a median white line and a sub-dorsal white line on each side; spiracles oval, black; tubercles minute, black; a roundish black spot on segments 3 and 4 a little above line of spiracles.

The caterpillars become full-grown in about a month from the hatching of the eggs. Like *unipuncta*, they may often be found on their foodplant in the daytime; in cane, hiding behind the leaf-sheaths.

Pupation takes place in an earthen cell a little below the surface of the ground, or beneath stones or rubbish. The pupa is about 19 mm. long by 5 mm. thick; medium brown, darker on the back, eyes nearly black; a row of about a dozen pits on dorsal side at base of abdominal segments 5, 6 and 7; apex of abdomen pointing a little ventrally, with two slightly diverging, pale spines, dark at base, curved ventrally and hooked at tip, a curved hooked bristle a little dorsally, and another a little laterally from each of these terminal spines. The moth emerges from the pupa in about two weeks.

## *Cirphis pyrrhias* (Meyrick).

*Leucania pyrrhias*, Meyrick, Fauna Hawaiiensis, I, Pt. III, p. 141, 1901.

*Cirphis pyrrhias*, Hampson, Cat. Lep. Phal. British Mus., V, p. 494, Pl. XCI, fig. 28, 1905.

**"Male and female, 39-46 mm. Head and thorax brown-reddish irrorated with whitish-ochreous. Abdomen densely hairy towards base, in male with dense expansible brownish-ochreous tufts at base beneath, and also in lateral basal cavities. Forewings pale brownish-ochreous, densely suffusedly strigulated throughout with brown-reddish; veins posteriorly ochreous-whitish, sprinkled with dark fuscous; costal edge sometimes white; first and second lines formed by series of indistinct dark fuscous dots, second rather strongly curved; lower end of reniform forming a small white dot, followed by a dark fuscous suffusion. Hindwings light rosy-ochreous." [Meyrick, Fauna Hawaiiensis, I. Pt. III, p. 141, 1901].**

This is a native moth usually living in the native forest regions above cultivated lands. The caterpillars normally feed on grasses, commonly Hilo grass; and on sedges, particularly *Baumea meyenii,* a large equitant-leaved species growing on the mountain ridges at elevations of 1000 feet and more. The caterpillar may often be found on the leaves of this plant, or hiding in the dead leaves and trash at its base. I have observed a few of them in the higher parts of the sugar cane plantations of the Hamakua and Hilo districts of Hawaii, where they were feeding on the young cane along with army worms and other cutworms. They have the habit of hiding behind the leaf-sheaths of the cane, in the daytime, as the caterpillars of *unipuncta* often do.

The moth is easily distinguished from the two preceding species as it is of a distinct reddish color, especially the forewings. The caterpillars are larger and plumper than those of *unipuncta,* and a little larger than those of *amblycasis.*

I once found about a dozen eggs of this moth in a row on a leaf of Hilo grass (*Paspalum conjugatum*). They were white, spherical, with a faint miscroscopical reticulation, about 1 mm. in diameter, distinctly larger than eggs of *Feltia dislocata.* The larvae from these eggs became full-grown in about a month. They molted five (possibly six) times at intervals of three to five days. The pupal stage occupied about three weeks.

The full-grown caterpillar is 42-45 mm.; olivaceous, with faint rosy tinge in places; head reticulated with brown; cervical shield traversed longitudinally by three whitish lines bordered on both sides by blackish; the whitish lines are faintly continuous on the body, the mid-dorsal one somewhat interruptedly bordered with brownish fuscous, each lateral one forms the lower boundary of an interrupted dark, brownish-fuscous subdorsal stripe; just above line of spiracles a much interrupted wide brownish-fuscous stripe, more distinct posteriorly and extending onto posterior proleg; other prolegs with a large blackish spot on outer side; tubercles; forming two rows of black dorsal dots; other tubercles not conspicuous; hairs short, pale; spiracles oval, black; a black dot in line with them on segments 3 and 4. Younger caterpillars are often paler; and in some of them the dark stripes are more conspicuous.

The pupa is formed a little beneath the surface of the soil, or under trash. It is about 22 mm. long by 6.5 mm. thick; medium reddish brown, a little darker on the back; near basal dorsal margin of abdominal segments 5, 6 and 7 is a transverse row of about twenty pits situated in a black line; apex of abdomen very blunt, cremaster slightly projecting near dorsal side, with two slender, slightly diverging, pale spines, black at base, curved ventrally and hooked at tip; a curved, hooked bristle a little dorsally, and another a little laterally from each of these spines; wing-cases, etc. extend to apex of fourth abdominal segment.

## THE GRASS ARMY WORM..

*Spodoptera mauritia* Boisd.

Plate II, figs. 7-11.

"Dark grey-brown with a rusty tinge; abdomen fuscous. Forewing with the sub-basal, antemedial, and postmedial double waved lines indistinct; the orbicular small and ochreous; the reniform blackish; the submarginal line whitish and irregularly waved; a whitish patch is often present between the orbicular and reniform and a dark patch on the central marginal area. Hind wing opalescent and semihyaline white, with a dark marginal line." [Hampson, Fauna of British India, Moths, II, p. 248, 1894].

This moth occurs in Mauritius, West Africa, and throughout the Oriental and Australian regions. Its caterpillars were formerly a very serious pest in the grass lands and sugar cane fields of the Hawaiian Islands; but their numbers were greatly reduced by the introduction of the Mynah bird. Now they are no longer a serious pest, though they are often numerous in grass, where the Mynah birds may be seen searching for them; but before the Mynah bird was introduced, it is reported that often whole fields of young sugar cane were eaten by them; and that the grass slopes in the valleys and mountains would be entirely consumed by them at times; in fact, they were in millions and behaved much like army worms. Besides feeding upon grasses and sugar cane, they also eat corn, peas, beans, and probably other kinds of garden plants.

During January and February, 1906, they caused considerable trouble at the Experiment Station by attacking the tiny cane seedlings which were being propagated. It required daily examination, and careful search, for the tiny larvae were green like the leaves; and although small, yet were big enough for one of them to soon destroy one of the little cane seedlings (which were 1-2 inches high) if not detected soon after it had started feeding. Fortunately they did not work after the manner of cutworms and cut a plant off immediately. Instead, they began eating at the tips of leaves, and they could be first detected by the dried remains of tips of leaves where they had fed, then closer looking would reveal the tiny green caterpillar, which on being disturbed dropped to the ground and could be readily killed. Usually but one caterpillar was found on one seedling; but sometimes more, even as many as four, in which case they soon destroy the plants.

## LIFE HISTORY.

The eggs (Plate II, figs. 10, 11) are spherical, slightly flattened at base where in contact with the object upon which they are deposited. They are dirty whitish or gray in color, and densely striated vertically. They are usually in large masses of one layer and in regular rows, and covered with gray hairs from the abdomen of the moth. There may be from 100 to 300 in one cluster. One moth may lay several hundred eggs; one specimen which I had in a breeding cage laid 700. The egg masses are not placed necessarily on the food plant; but usually high up, often on the leaves of banana and small palms, or other small trees or shrubs at three to five feet elevation. It is also common to find them on the sides of buildings and other structures. In one instance I found a batch of eggs ten feet up on the side of a building. The eggs hatch in three to four days from the time they are laid, and the tiny larvae drop to the ground by means of a silken thread, where they will find grass or other suitable food plant. They feed at first at the tips of leaves, eating the green substance of the leaf and leaving the epidermis, which dries up, giving a dead appearance. When a few days old, they eat the entire substance of the leaf from its margins, producing notches and a very ragged appearance.

After molting five times at intervals of two to six days, the caterpillars become full-grown in two to three weeks (Plate II, figs. 8, 9). They are then about 1.3 inch long (35 mm.). They vary a great deal in coloration. Some are nearly uniform grass green with median dorsal and sub-dorsal white lines; others are nearly black, with a sub-dorsal stripe and a stripe on line with spiracles darker than the rest, and a yellowish (sometimes pinkish) stripe below spiracles, underside pale. There are all gradations between these two. A common form is green with the sub-dorsal and spiracular stripes black; another form has the stripes broken up into a series of black spots, one spot to each segment. The spiracles are always black, and in the black form there is a white dot a little above and behind the spiracle on segments 5 to 12. Hairs minute. Tubercles inconspicuous.

The pupa is formed in an earthen cell a little below the surface of the soil. It is medium dark brown, a little more than half in inch in length (12 to 15 mm.). At its apex are two straight slender-pointed spines set rather wide apart and nearly parallel.

The moth emerges from the pupa in eight to fourteen days, and is ready for egg-laying in two to four days. Thus the whole life cycle occupies only five to six weeks. With wings spread, the moth is 1.25 to 1.50 inches (30 to 35 mm.). The fore wings of the female are a dark gray with darker waved lines crossing at one-third and two-thirds from the base, a row of triangular black dots on terminal margin, and two or three marks a little before terminal margin. A little before middle of wings is an oval yellow spot. The hind wings are whitish with brown on margins and veins. The forewings of the male are much paler than those of the female and have varying shades of very pale brown; the lines and markings are more distinct.

## THE LESSER NATIVE CUTWORM.

*Feltia dislocata* (Walker).

(Plate II, Figs. 3-6.)

*Agrotis dislocata*, Meyrick, Fauna Hawaiiensis, I, Pt. III, p. 146, 1901.

*Feltia dislocata*, Hampson, Cat. Lep. Phal. British Mus., IV, p. 351, Pl. LXVIII, fig. 12, 1903.

"Male and female; 34-47 mm. Head and a marginal band along front of thorax light ochreous-brown, rest of thorax whitish-fuscous. Antennae in male bidentate with triangular processes. Forewings light fuscous, more or less irrorated with white, and sometimes darker-sprinkled; veins marked with dark fuscous lines, except lower margin of cell, which is white; interior of cell paler and more ochreous, usually marked with a black dot towards base; orbicular and reniform combined into an elognate posteriorly abruptly dilated mark, fuscous, outlined with black; a darker fuscous black-outlined streak beneath cell from base to middle, somewhat dilated posteriorly; a pale ochreous longitudinal suffusion beneath this from base to near tornus; sometimes short undefined blackish dashes or dark-outlined marks between bases of veins 2-6. Hindwings fuscous." [Meyrick, Fauna Hawaiiensis, I, Pt. III, p. 146, 1901].

This is a native cutworm and often becomes a bad pest in sugar cane, as well as in gardens and also on other crops. From my observations, it is more injurious to garden crops than to cane; but they are often reported numerous locally in cane fields. I have often taken them in cane fields in company with the army worm (*Cirphis unipuncta*). They are slightly larger than the latter. and have more strictly the cutworm habit of feeding; that is, of hiding during the day in the soil or under trash and rubbish on the surface of the soil, and feeding at night on the lower leaves of the plant.

### LIFE HISTORY.

The eggs (Plate II, figs. 5, 6) are laid at the base of plants, or even scattered on the soil, sometimes singly, sometimes two or three adhering together, and sometimes as many as a dozen in a bunch together or even a hundred or more in an irregular one-layed mass. They are of a yellowish white color, nearly spherical, 0.8 mm. in diameter, minutely reticulated at upper pole and radiately ridged from it down the sides.

They hatch in a week or ten days. The caterpillars molt five times at intervals of four to six days, attaining their full-growth (36-40 mm.) in three to five weeks (sometimes much longer than this in hot, dry seasons).

The full-grown caterpillar (Pl. II, fig. 4) is of a dirty brownish color, with a broad lighter brown stripe on the back; under side dirty whitish. Tubercles black, a row of them on each side of the dorsal lighter stripe, are larger and more conspicuous than the rest. Hairs short, black. Spiracles oval, black. Head rather small proportionately, brown with blackish spot above each eye cluster, and two black bars in front converging above. The dorsal part of first segment behind head very dark brown. The full-grown caterpillar forms an earthen cell in the ground a few inches below the surface. After four to six days it transforms to the pupa which is similar in form to the pupa of *Cirphis unipuncta*, about 17 mm. long, and of a pale yellowish brown color. The moth appears in 15 to 20 days, which makes a period of about two months from the time eggs were laid.

The moth (Pl. II, fig. 3) with wings expanded is about 1½ inches, or 40 mm. It is of a whitish grey color. The fore wings have a longitudinal white streak for more than half their length, behind which is a shorter blackish streak, which in turn has a yellowish streak behind it. The veins are marked with dark lines, and there is a row of dark dots on termen. Hind wings a little darker, with pale fringe. The wings when at rest are held straight backward over the back, often tipped so as to lie close along the sides of abdomen.

## THE LARGER NATIVE CUTWORM.

*Agrotis crinigera* (Butler).

Plate II, figs. 12, 13.

**"Male and female, 49-54 mm. Head and front of thorax brownish, rest of thorax light fuscous. Antennae in male filiform. Fore-**

**wings long, rather narrow; light fuscous, darker-sprinkled, sometimes partially faintly rosy-tinged; subbasal and first lines obscurely pale, dark-edged, first irregularly waved-dentate, very acutely on vein 1b; median thick, cloudy, dark fuscous, slightly curved; second with dark inner edge acutely waved-dentate, outer faint or obsolete, regular; orbicular oval, dark-centred, dark-outlined; reniform dark-suffused, including three obscure paler transverse marks, resting on posterior edge of median line; claviform faintly indicated, narrow, elognate; subterminal line sometimes faintly paler, faintly darker-edged anteriorly. Hindwings light fuscous. [Meyrick, Fauna Hawaiiensis, I, Pt. III, p. 148, 1901].**

This is another native cutworm, and is often a bad pest. It sometimes occurs in sugar cane; but more often attacks other vegetation rather than grasses and cane. It is fond of garden peas and beans and other garden plants, and I have found them abundant in fields of cow peas. I have also found them feeding abundantly on a native shrub (*Sida*), also on several kinds of weeds as *Portulaca* and *Datura* ("Kikania"). The caterpillars usually hide in the soil or below debris in the daytime; but I have frequently observed them feeding on the plants in the daytime, and have also found them hiding among the leaves.

### LIFE HISTORY.

The egg-laying habits are unknown. From very small caterpillars which I have found and reared, I estimate that it takes the caterpillars about one month to six weeks from hatching till they are full-grown. They are then 45 to 50 mm. in length and are more plump than other cutworms; in fact, this is the largest of our common cutworms.

The full-grown caterpillar (Plate II, fig. 13) is quite similar to that of *Feltia dislocata*, but quite a bit larger; more blackish above, and paler below; the tubercles are not so conspicuous, the row below spiracles pale instead of black. The head lacks the black spot above eye cluster.

The pupa is formed in an earthen cocoon 30 mm. by 15 mm. It is 21 to 25 mm. long; light brown in color, darker on the back. The pupal period is 21 to 25 days, thus the life-cycle from egg to adult moth is probably a little more than two months, occupying a little longer period than the other common species on account of its larger size.

The moth (Plate II, fig. 12) measures two inches with its wings spread. It is of a brownish grey color, the male paler than the female. The male also has large tufts of yellowish hairs at the apex of the abdomen. The fore wings have some darker markings, viz., a roundish area a little anterior of the middle of the wing, an oval ring a little nearer to the base, a zigzag line across the wing about one-third the distance from the base, another zigzag line about three-fourths from the base, a row of triangular dots at termen. Hind wings nearly uniform very pale brown, a little darker on the veins.

## THE BLACK CUTWORM.

*Agrotis ypsilon* (Rottenburg).

Plate II, figs. 1, 2.

"Head and thorax red-brown, the latter suffused with fuscous; frons with blackish bar above; back of head with two black spots; tegulae with brown and black medial band; pectus whitish; tibiae and tarsi ochreous white and black; abdomen grey-brown. Forewing ochreous irrorated with brown; the costal area suffused with fuscous brown, and often the whole wing to the postmedial line; a double, waved, subbasal line from costa to the submedian fold; a double, waved antemedial line dentate inwards on median nervure and vein 1 and outwards above inner margin; claviform moderate or small, defined by black; orbicular and reniform defined by black and with fuscous centres, the fomer small, elliptical, or with its outer edge produced to a point, the latter with wedge-shaped black spot from its outer edge; an indistinct dentate medial line; a double minutely dentate postmedial line produced to points on the veins, bent outwards below costa, excurved to vein 4, then incurved; a subterminal series of pale and black dentate marks, those above veins 4, 5 with the black on their inner side stronger and some fuscous suffusion on their outer; the veins towards termen with dark streaks; a terminal series of points. Hind wing semihyaline white, the veins, costal and inner areas, and termen tinged with brown, strongly in female and in the New Zealand form." [Hampson, Catalogue of the Lepidoptera, British Museum, IV, p. 368, 1903].

This is a well-known garden cutworm throughout the United States. It ranges in America from Hudson Bay south to Uruguay; is common in Europe; also occurs in northern and southern Africa, India, China, Japan, Java, Australia and New Zealand. It is a typical cutworm in its feeding habits,

i. e., feeding on plants at night-time, often cutting off small plants at or below the surface of the soil, and hiding under leaves, trash, or burrowing in the soil during the daytime. It is a very general feeder, attacking nearly all kinds of garden and field crops, and even weeds. I have never found it very abundant in cane fields, nor have I known of it being reported so, though it does frequently occur along with the other species and is partially responsible for the damage done. I have found them in fields of young cane, when no evidence could be found of their having eaten the cane. They were beneath plants of pigweed (*Purslane*) upon which they must have fed. In the United States they are particularly troublesome to corn, cotton, cabbage, tomato, and tobacco, attacking the young plants, one cutworm often destroying several plants in one night. In India they are destructive to young tea and coffee plants and opium.

## LIFE HISTORY.

The eggs are domeshaped, about 0.5 mm. in diameter, and creamy white in color. There is a small circular depression at the upper pole from which radiate numerous ridges running down the sides to the base or surface in contact with a leaf. The eggs are laid on the surface of leaves or stems of plants near to the ground. From one to many eggs may be placed close together in one batch, and one moth may produce several batches amounting to two or four hundred eggs.

The larvae hatch from the eggs in a few days (usually two to four). They molt five times at intervals of two to six days and become full-grown in about one month. The full-grown caterpillar (Plate II, fig. 2) is about 1.75 inches long (45 mm.). It is of a nearly uniform dark greasy gray color, paler below. The spiracles are black. The tubercles are conspicuous, showing as regular rows of brownish dots. Head and dorsal part of segment behind head dark brown.

The pupa is formed in an earthen cell a little below the surface of the soil. It is about .75 inch long (20 to 23 mm.), uniform medium brown in color, with a dark dorsal band at apex of abdominal segments 4, 5, 6 and 7, containing irregularly arranged small pits. At the tip of abdomen are two large tapering spines, black at base and pale at tip, a little distance apart at base, slightly diverging but curved together at their tips.

The moth (Plate II, fig. 1) emerges from the pupa in ten days to three weeks. It is about two inches in expanse of wing.

## THE VARIEGATED CUTWORM.

*Lycophotia margaritosa* (Haworth).

Plate III, figs. 1-2.

*Agrotis saucia*, Meyrick, Fauna Hawaiiensis, I, Pt. III, p. 143, 1901.

*Peridroma margaritosa*, Dyar, List of North American Lepidoptera, p. 134, 1902.

*Lycophotia margaritosa*, Hampson, Cat. Lep. Phal. British Mus., IV, p. 536, fig. 92, 1903.

> "Head and thorax brown mixed with ochreous; palpi fuscous except towards extremity; thoracic crest often whitish; abdomen grey-brown. Fore wing brownish ochreous irrorated with brown; a double waved subbasal line from costa to vein 1; a double waved antemedial line; claviform moderate, with brown outline and line in centre; orbicular and reniform large with brown outlines, the former elliptical, the latter with fuscous in its lower portion; the postmedial line dentate and produced to points on the veins, bent outwards below costa, excurved to vein 4, then incurved; the subterminal line ochreous, angled outwards at vein 7 and dentate at veins 4 and 3, with fuscous spots on its inner side at costa and on its outer from below apex to middle; a terminal series of small dark lunules. Hind wing semihyaline white, the veins and marginal areas brown; the underside with discoidal point and the costal area irrorated with brown." [Hampson, Catalogue of the Lepidoptera, British Museum, IV, p. 536, 1903].

This is another cosmopolitan cutworm, being widely distributed over Europe, Asia, North Africa, North and South America, from Canada to Argentina.

It is a general feeder, eating the usual garden and field crops and not particularly grasses. It is also a green-house pest in the States, feeding largely on violets and other ornamental plants. In the Hawaiian Islands, besides feeding on garden crops it also feeds upon sugar cane to some extent, being frequently found in cane fields along with the army worm. Brother Matthias Newell of Hilo has reared them on orange leaves, from an egg mass found on an orange leaf. They also feed upon some common weeds. I have found them quite numerous on "pualele" (*Sonchus*), and occasionally on "kikania" (*Datura*), *Xanthium* and purslane. They often remain feeding on the plants in daytime.

## LIFE HISTORY.

The eggs are deposited in regular masses, often in regular rows on the surface of leaves or twigs, usually a large number in a mass, often several hundred. The egg is about .6 mm., hemispherical, flattened on the surface in contact with the leaf or twig. It is radiately ribbed from the upper pole, and has minute cross ribs between these. The young larvae are green with black heads. They molt five times before attaining their full growth, which takes about a month or a little more.

The full grown caterpillar (Plate III, fig. 2) is about 1.75 inches (40-45 mm.). It varies much in color. Head pale brown, reticulate with dark brown, a slight line upward from eyes, two curved vertical broad dark bands in front. Body brown, more or less generally mottled with darker and lighter brown and some yellowish; dorsal line pale yellowish often broken into a series of yellowish patches on segments 4-7, (sometimes on segments 3-9); segment 12 mostly yellow dorsally on posterior part; a yellowish line below the spiracles, which are black. Tubercles and hairs very minute. In darker forms the browns are nearly black. There is a more or less irregularly interrupted blackish streak just above the line of spiracles. A sub-dorsal line consisting of blackish spots on each segment. On several of the segments there is a dorsal lozenge-shaped spot slightly darker than the general color, but not so dark as the blackish stripes. A blackish spot on outer side of each proleg.

The pupa is formed in the ground a few inches below the surface, or beneath trash. It is 19 mm. in length, and of a uniform medium brown color, its apex armed with two spines very close together, the basal half of each spine black, the tips white. The moth appears in two or three weeks.

This moth (Pl. III, fig. 1) measures 1.75 to 2 inches (45 50 mm.), with wings spread. It is of a pale grayish brown, tinged faintly with reddish. The fore wings are shaded about the middle and toward the outer margin with darker brown, and a row of dark triangular dots on the outer margin. There are two roundish-oval lighter spots a little forward of the middle of the wing. The hind wings are paler at base, and darker about the margins and on the veins.

## REMEDIES.

The ravages of army worms and cutworms may be checked by poisoning them. One method is to spray the poison onto the plants in liquid form. For this, Paris green may be used, or Disparene; the former at the rate of one half pound per 50 gallons of water; the latter at the rate of two pounds per 50 gallons of water. The most general practice in these Islands is using poisoned bait. For this, Paris green is mixed with bran or middlings. To make this, add two or three ounces of sugar or molasses per gallon of water, then stir in bran at the rate of about one pound per gallon of water. Thoroughly mix poison with this at the rate of one pound per 50 pounds of the moistened bran. The mixture is to be scattered throughout the infested regions. The mixture may be made dry, using one pound of Paris green to 20 pounds of bran and middlings mixed in equal parts. Another method of applying poisoned bait is to spray with poison some green crop as grass, clover, or alfalfa; then cut this and scatter in the infested regions, preferably late in the afternoon, so that it will not become too much wilted before the cutworms feed upon it in the evening. The advantage of using poisoned bait in a cane field is that the cutworms hiding in the ground during the day are most likely to eat the poisoned bait when coming forth at night to feed, rather than climbing the young cane shoots to feed on their leaves.

## NATURAL ENEMIES.

### BIRDS.

One of the best checks to the increase and ravages of the army worms is the mynah bird. This bird was introduced from India about twenty or more years ago, for the very purpose of feeding upon army worms and cutworms. Although it has some other undesirable habits, yet it is very valuable for this purpose. It has increased probably to its maximum limit, and is perhaps at present somewhat reduced in numbers on account of the lack of Lantana berries which at one time formed a large part of its diet.

It is to be found practically everywhere throughout the Islands, at least the habitable and cultivable portions. With its increase has come the decrease in devastation by army worms and cutworms; whereas previously it is reported that whole fields of young cane were stripped off by the great numbers of caterpillars, and that grass lands of great areas were likewise totally eaten off, particularly by the grass army worm (*Spodoptera mauritia*), in recent years the damage has been slight compared with formerly.

The golden plover (*Charadrius fulvus*) also lives largely on these caterpillars. They come from Alaska to these Islands for the winter season, coming in August and remaining till the following April. Before leaving they become very fat from their cutworm diet. In regard to their habits, I quote from Dr. Perkins in Fauna Hawaiiensis:

> "In many parts of the Islands large numbers of plover habitually resort to the margin of the sea and the extensive mud-flats for feeding purposes, but the greater part scatter over the lower-lying grass lands and the open mountain country, where they may be found even as high as five or six thousand feet above the sea. In such localities they find abundant food in the caterpillars of various Noctuid moths, and indeed in the moths themselves. Of all the Island birds the plover is beyond question the most valuable to the grazier and the agriculturist, and it is singularly unfortunate that it is a most excellent bird for the table, and at the same time the one most generally sought after by sportsmen.
>
> "I have been at some pains to learn exactly the species of Noctuidae which form the favorite food for the plover, whether as moth or caterpillars, and I have several times shot the bird at the instant that it has seized a moth in its hiding-place at the roots of grass. I am therefore able to state positively that it catches the moth both of *Agrotis crinigera* and *dislocata*, the caterpillars of which are the two most extremely injurious and wide-spread of all the Island 'cutworms.' It also obtains the caterpillars of both these and other species and feeds, as is well known, to an enormous extent on the grassy army worm (*Spodoptera mauritia*), a caterpillar which not

only locally entirely clears off the freshly grown grass, but also does some damage to the young leaves of sugar cane.

"For these reasons the plover is worthy of all encouragement by the agriculturist and should never be shot on or around his land, or, if this is done, he should not complain when his crops are ravaged by cut-worms, as is often the case."

The English sparrow is abundant on Oahu, though not on all the other Islands, and has been observed to prey upon army worms to some extent.

### TACHINA FLIES.

These parasites are very valuable in helping keep cutworms and army worms in check. They prey upon numerous other kinds of caterpillars also; I have reared one species from fourteen species of caterpillars, and another from eleven species.

There are eight native species of cutworms of the genus *Leucania,* and 24 species of the genus *Agrotis.** The most of these are rare, and are probably kept so by these parasites. They are found common on all of the Islands, and where cutworms or army worms are numerous they will be found numerous also. I have collected caterpillars in quantity in cane fields in different parts of the Islands and examined for maggots of these parasites, and often found as many as 25% to 35% of them parasitized. In one lot sent to the Experiment Station from Hamakuapoko, Maui, 70% were parasitized.

### *Frontina archippivora* (Williston).

The habits of this species are given on pages 47 to 49 of Bulletin V, Experiment Station, H. S. P. A., Division of Entomology. It is figured on Plate VI, fig. 4.

### *Caetogaedia monticola* (Bigot).

Plate III, figs. 8-13.

Bigot, Ann. Soc. Ent. France, (6) VIII, p. 91, 1888.

This large Tachina fly was described from the Rocky Mountains; has also been reported from California. It occurs throughout the Hawaiian Islands, on the lowlands and well up into the mountains. They are found common wherever army worms or cutworms are numerous. In examination of numerous army worms collected at different times from several different districts, not so many were parasitized by this Tachina as by *Frontina archippivora*, yet a good many were; and of the rarer native cutworms which I have obtained specimens of from time to time, more were parasitized by *Chaetogaedia* than by *Frontina;* in fact, it is difficult to get specimens of some of the native cutworms which are not parasitized. Other species of caterpillars are also parasitized by this Tachinid. I have reared it from 11 different species of caterpillars.

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* As given by Meyrick in Fauna Hawaiiensis.

This fly is much larger than a house fly, and of much the appearance of the large grey flesh fly, from which, however, it may be readily distinguished by its habits and flight. It is more solitary, and does not frequent decomposing substances.

The following observations on the habits of this fly were published by the writer in the Proceedings of the Hawaiian Entomological Society, II, No. 1, pp. 7-9, Oct. 1908. [Paper read at March meeting, 1908].

"It is but recently that I discovered the method of egg-laying of this fly. It is usually stated in entomological literature that Tachina flies lay their eggs on the bodies of their hosts; in fact with certain species the act has been observed. but for far the greater number of them the act of egg-laying has not been observed, or at any rate not recorded. That *Chaetogaedia* had a different method of laying eggs. was surmised, when in June. 1907. this parasite was reared from more than half of a lot of pupae of *Agrotis cinctipennis*, one of the less common native cutworms. The eggs of this lot of cutworms were hatched in breeding cage and grew to maturity without the possibility of access of a Tachina fly; hence, considerable of a mystery arose when more Tachinids than moths bred out from the lot.

"This mystery was not cleared up till in February, 1908, when in watching a female *Chaetogaedia*, as I supposed, hunting for caterpillars amongst grass and weeds, I observed that she was laying eggs on the grass leaves. She would quickly crawl around among the leaves, only stopping momentarily to place an egg here and there on the surface of a leaf, never more than one per leaf. They were placed on the leaves of weeds as well as on the grass. After making this observation, it was easy to explain how the caterpillars previously alluded to, became parasitized; for they were daily supplied with food (mostly *Sonchus*) gathered from outside where Tachinas were common, and had undoubtedly deposited many eggs on the leaves. The caterpillars ate the leaves with the eggs there-on, which hatched inside and grew to maturity, not, however, killing the caterpillars till after the latter had transformed to pupae.

"I have since learned that another Tachina fly has similar habits of laying its eggs, the "Uji," which is very destructive to silk worm caterpillars in Japan. This is the only instance I have found in entomological literature of a Tachinid laying its eggs otherwise than directly on the host (caterpillar, grass hopper, or whatever it is.)

"The egg-laying habits and the life history of the "Ugi" (*Ugimya sericariae* Rondani) were published in detail by Sasaki, in Journ. Sci. Coll. Imp. Univ. Japan, 1886. The eggs are laid on mulberry leaves, eaten by the silk worms; hatch in the digestive canal in a few hours; the larvae bore thru its walls, feed on the ganglia for a time; later enter the tracheal system and become located in a sort of cup or sac, with the spiracles at the posterior end near a spiracle of the caterpillar and the anterior end with the body cavity where it is convenient to feed on the fat of the silkworm; when fully developed the maggot forces its way out thru the skin of the silkworm (or pupa, if it has pupated); enters the ground to form its puparium, within which it remains thru the winter.

"*Chaetogaedia monticola* agrees with this in some parts of its development. The eggs are laid on leaves as before stated. The egg of *Chaetogaedia* appears as a tiny black dot on a grass leaf. It is .44 mm. long by .25 mm. broad, quite regularly ovate, shaped like a hen's egg only somewhat flattened where in contact with the leaf; smooth and shining black. A female dissected was found to have several hundred of them in the uterus. Another female which bred out in capavity, was dissected when several days old, to count the eggs. The uterus contained 1066 eggs* which were black and apparently ready for oviposition. The ovarian tubes, which are numerous and collected into two ball-like structures, were full of immature ova. Probably the majority that are laid are not eaten by caterpillars; hence, the provision of such a large number is to insure some of them being eaten. They are so small as to escape being injured by the jaws of the caterpillars in biting off bits of leaf, tho probably some are destroyed. They soon hatch in the alimentary canal of the caterpillar and bore thru its walls to the surrounding body cavity. If they did not hatch the same day they would probably pass out with the excrement. A caterpillar which had been fed with leaves on which quite a number of *Chaetogaedia* eggs (dissected from a caught female) had been spread, died after 5 days. It was dissected and 24 maggots of the parasite were found inside. They were about 2 mm. long and were mostly located in the head and anterior segments of the caterpillar. Other caterpillars which had been similarly treated and had died, were dissected and fewer maggots found inside. With so many maggots there is not food enough for all, so the caterpillar dies too soon before the parasites can become full-grown. Perhaps only those caterpillars which have eaten but one egg, or have had but one egg hatch inside of them, are able to survive till the maggot becomes full-grown, and those having more than one maggot inside die too soon, and thus the maggots themselves die; at any rate, I never have reared more than one parasite per host, nor have I found more than one puparium formed per host.

---

* I have since counted 4944 eggs from the uterus of one female.

"In dissecting caterpillars containing maggots, I never have found maggots feeding on the nerve ganglia, as Sasaki has; but I have found them located, as he says near a spiracle of the caterpillar, and enclosed in a sort of sac which is apparently an enlarged tracheal tube, the maggot locating in it when small and the tube becoming enlarged as the maggot grew. Usually there is a blackening of the caterpillar externally where one of these is located. When about full-grown the maggot leaves the sac and lies lengthwise in the caterpillar (or pupa, if it has pupated) eating up all or nearly all of the fatty matter of the latter. It may be nearly full-grown at the time the caterpillar pupates, or it may be still quite small; but I never have known of a case where the puparium of the parasite was formed before the caterpillar had pupated. The puparium is cylindrical, rounded at the anterior end, and rather blunt at the posterior end where it is often somewhat widened. It is of a very dark reddish color, and each of the two spiracular orifices at the posterior end has three black rounded protuberances around it. The anterior end is always directed anteriorly in the host pupa. The adult fly emerges in about 10 to 14 days from the time the puparium is formed."

Shortly after the above was published, I received a copy of Technical Bulletin No. 12, Pt. VI, U. S. Bureau of Entomology, issued Sept. 1908. In this Mr. C. H. T. Townsend gives the results of observations on the habits of tachinids, gathered from the experience of himself and others in rearing imported tachinids at the Gypsy Moth Laboratory, Melrose Heights, Massachusetts.

These results were quite startling. Among the species of European, Japanese and American tachinids dealt with, there were found to be five different styles of reproductive habit; namely: **host-oviposition; leaf oviposition; supra-cutaneous host-larviposition; sub-cutaneous host larviposition and leaf-larviposition.**

As a conclusion from these results, great importance is attached to those species having the leaf-oviposition habit as parasites for the gypsy moth. All of these species produce large numbers of eggs, as high as 5000 having been found contained in the uterus of one species.

During the summer of 1909, I have made the following additional observations of interest on *Chaetogaedia monticola.*

A female (taken in the field) was placed in a cage where there was growing grass on which she might oviposit. She died on the second day, however, without having laid any eggs. On dissection the uterus was found to be filled with a large number of eggs. Some of these were examined, and all stages of development were found, some apparently ready to hatch. Examination was made by placing a number of eggs on a glass slip and applying pressure with the point of a knife blade, when the shells of the eggs would burst with an audible snap and allow the embryos to emerge, many of them without injury. Some of these were still retained in the vitelline membrane, while others were entirely free from it and were to be seen crawling about, which shows that they are fully developed, ready to hatch, before the eggs are laid. This accords with the observations of Townsend and Sasaki. Many of those still enclosed in the vitelline membrane, were seen to be active, wriggling about, revolving and even doubling up, as fully developed as those which had escaped from the vitelline membrane.

Some of the eggs from this same female were retained in a dry condition in a vial. They were examined from time to time, and it was found that at the end of four weeks, there were some of them with living embryos; showing that they undoubtedly may remain alive on the leaves of plants for some little time, if not immediately eaten by caterpillars.

As regards the hatching of tachinid eggs after being eaten by caterpillars, no satisfactory explanation has yet been given. The shell of the egg is so hard that it seems unlikely that it could be sufficiently affected by the digestive juices of the caterpillar, quickly enough to allow the maggot to escape from the egg, and also have time enough to pass thru the wall of the alimentary canal before it would be carried along and be expelled with the frass of the caterpillar—this latter being a rather rapid process in a normally feeding caterpillar.

In my earlier notes, above, I have said that the eggs are so small as to escape being injured by the jaws of the caterpillars in biting off bits of leaf. I quote the following from Townsend on page 109 of the bulletin above referred to: "Furthermore, the chitinization strengthens the egg and thus lessens the chance of injury to it while being swallowed. Still further, we have found that the chorion of all these eggs possesses a minute raised reticulation, which we consider is in-

PLATE I.

Cane shoot badly eaten by army worms.

## BULLETIN No. 7

~~CIRCULAR No. 5.~~

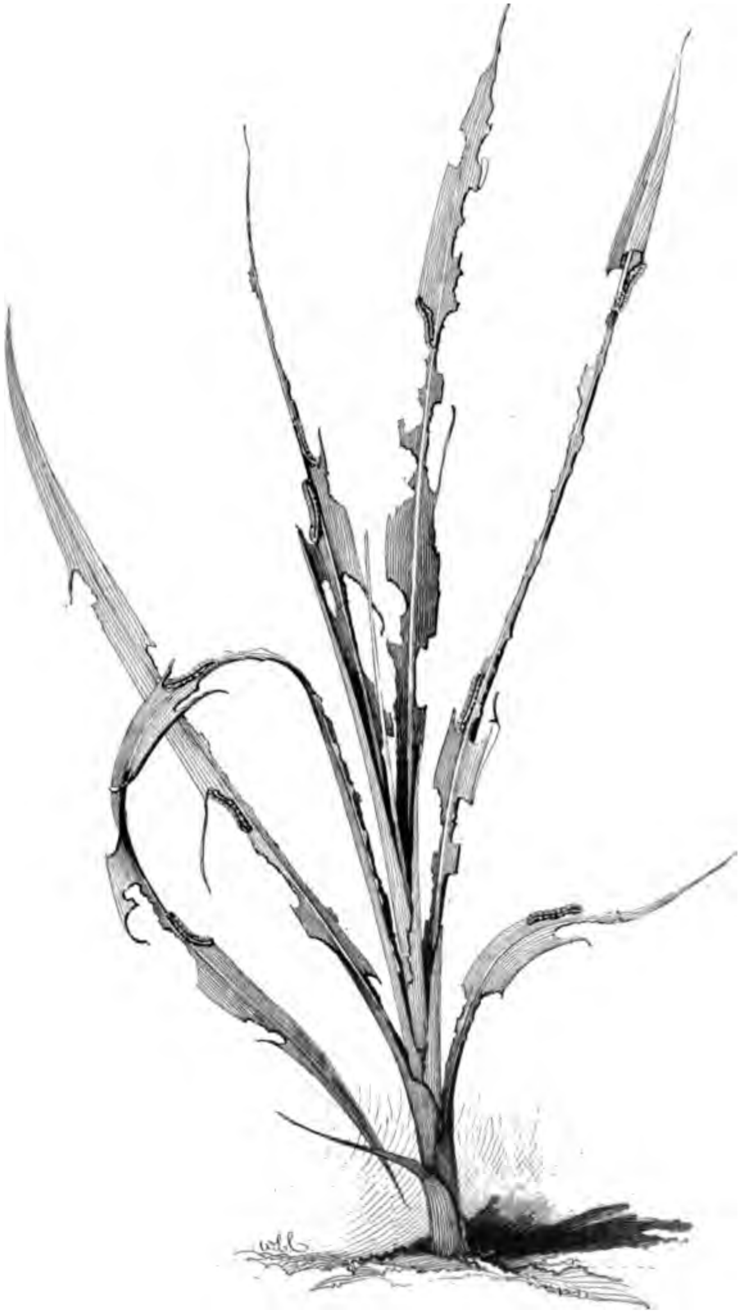

PLATE I.

## Plate II.

| | | | |
|---|---|---|---|
| 1 | *Agrotis* | *ypsilon,* | male. |
| 2 | " | " | caterpillar; p. prolegs, s. spiracles, t. tubercles. |
| 3 | *Feltia* | *dislocata,* | male. |
| 4 | " | " | caterpillar. |
| 5 | " | " | cluster of eggs. |
| 6 | " | " | egg highly enlarged. |
| 7 | *Spodoptera* | *mauritia,* | male. |
| 8, 9 | " | " | caterpillar, (two color varieties). |
| 10 | " | " | cluster of eggs. |
| 11 | " | " | egg highly enlarged. |
| 12 | *Agrotis* | *crinigera.* | male. |
| 13 | " | " | caterpillar. |

**BULLETIN No. 7**

~~CIRCULAR No. 5~~.

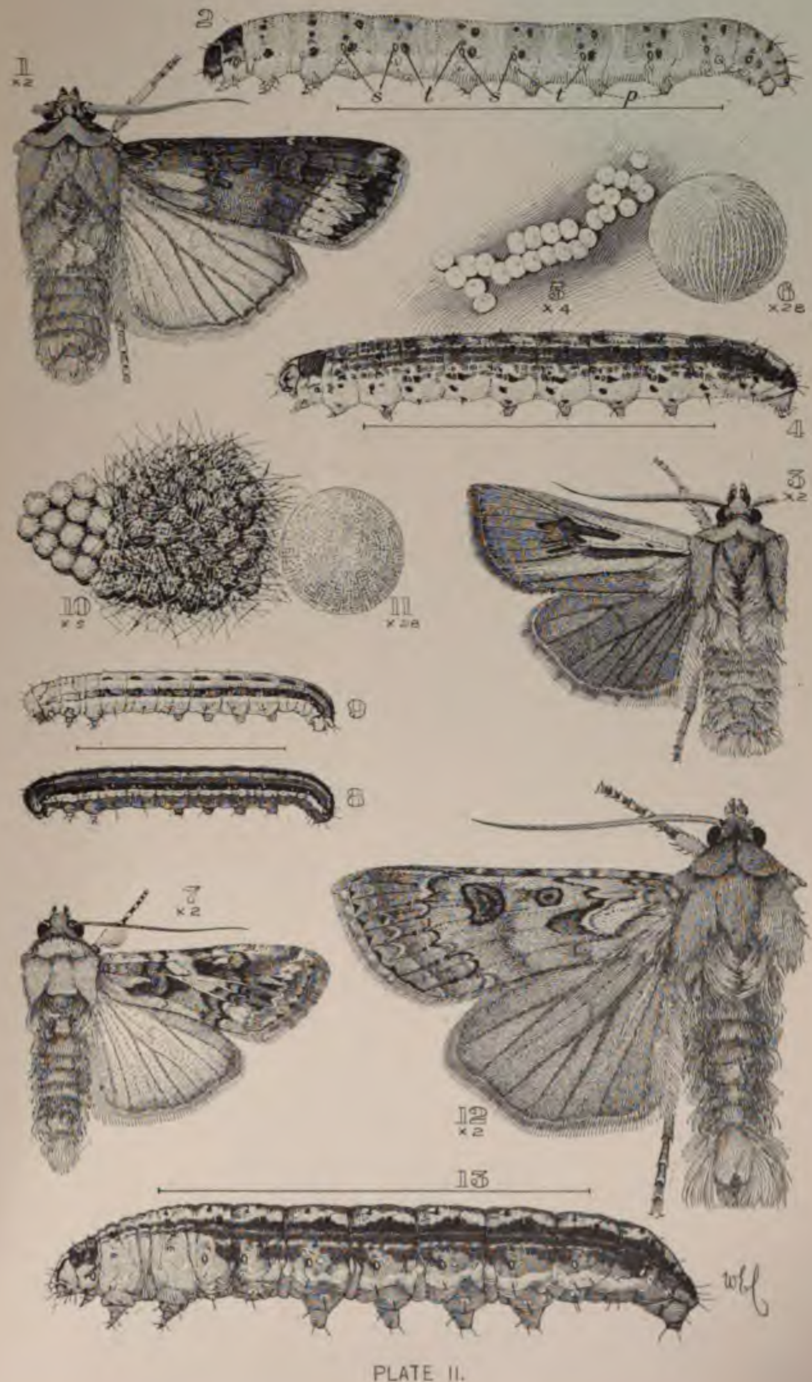

PLATE II.

## PLATE III.

1 *Lycophotia margaritosa,* male.
2 “ “ caterpillar.
3 *Cirphis unipuncta,* male.
4 “ “ caterpillar.
5 “ “ pupa.
6 “ “ apex of pupa highly enlarged.
7 *Ichneumon koebelei,* female.
8 *Chaetogaedia monticola.*
9 “ “ larva.
10 “ “ puparium.
11 “ “ posterior segment of puparium highly enlarged.
12 “ “ egg on grass leaf, enlarged.
13 “ “ egg highly enlarged.

BULLETIN No. 7

~~CIRCULAR No. 5~~

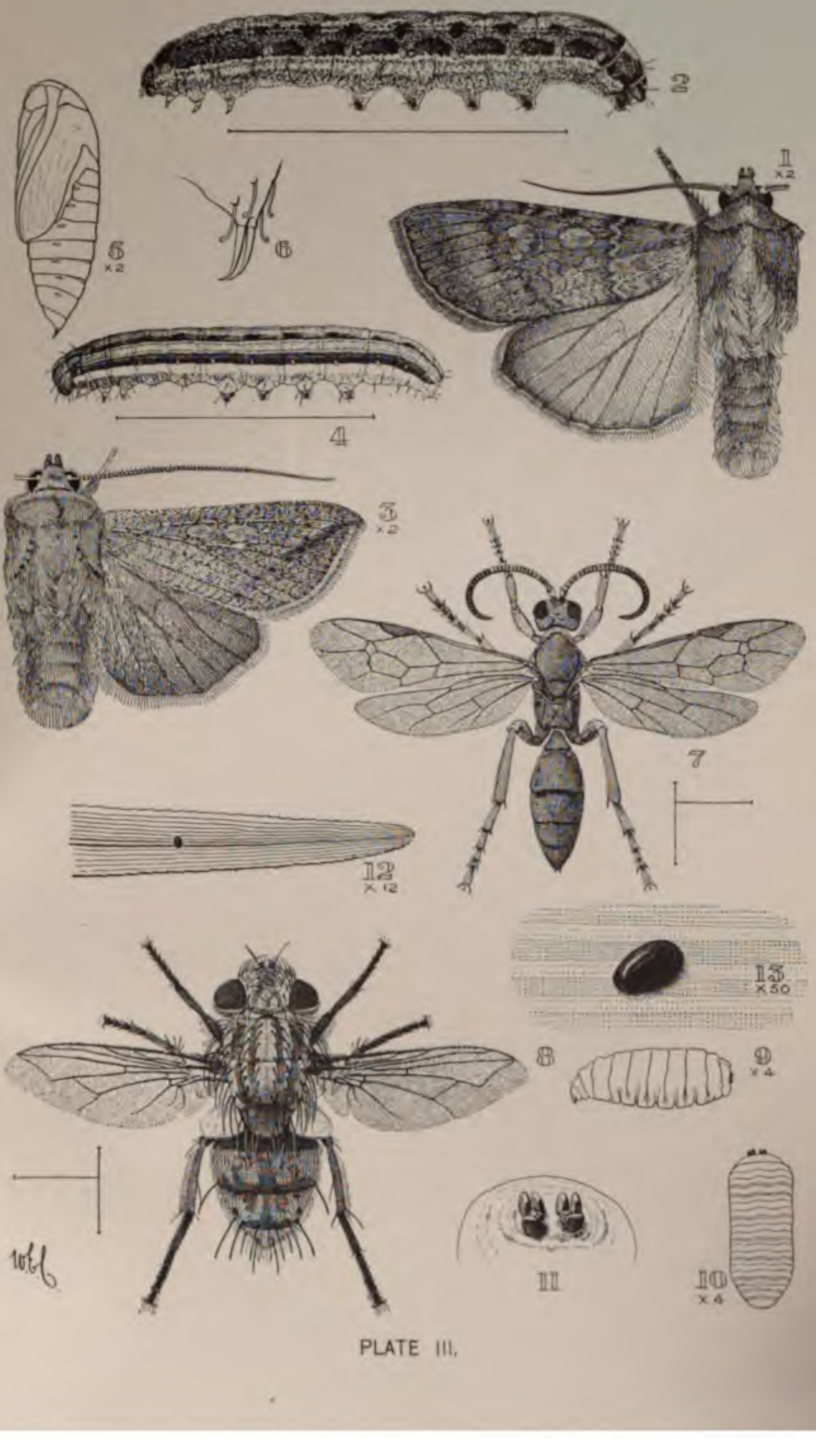

PLATE III.

H389

ENTOMOLOGICAL SERIES.

BULLETIN No. 9

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

# On Some New Species of Leaf-Hopper (Perkinsiella) on Sugar Cane.

By F. MUIR

HONOLULU, HAWAII.
DECEMBER 16, 1910.

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ENTOMOLOGICAL SERIES. BULLETIN No. 9

REPORT OF WORK
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# On Some New Species of Leaf-Hopper (Perkinsiella) on Sugar Cane.

By F. MUIR

HONOLULU, HAWAII.
DECEMBER 16, 1910.

# LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the
Hawaiian Sugar Planters' Association,
Honolulu, Hawaii.

Dear Sirs: I herewith submit for publication, as Bulletin No. 9 of the Entomological Series, a paper prepared by Mr. F. Muir, entitled: "On Some New Species of Leaf-Hopper (Perkinsiella) on Sugar Cane."

Yours very truly,

C. F. ECKART,
Director.

Honolulu, Hawaii, October 19, 1910.

# ON SOME NEW SPECIES OF LEAF-HOPPER (PERKINSIELLA) ON SUGAR CANE.

## Perkinsiella Kirkaldy.

This genus was erected by Kirkaldy for *saccharicida* in 1903. It differs from *Dicranotropis* in the first joint of antennae being broader at the apex than at the base and both joints somewhat flattened, not cylindrical, also in the presence of two spines on ventral margin of pygophor. The genus is particularly attached to sugar cane (*Saccharum officinarum*), only occasionally going on to other grasses. The thirteen known species are distributed in the following manner:—

New Guinea 6, Amboina 3, Ceram 1, Java 4, Borneo 3, Australia 2, Fiji 2, Hawaiian Islands 1 (introduced), China 1.

From this it appears that it is a Malayan genus with its center in New Guinea. Considering the amount of sugar cane taken from island to island in native boats, it is surprising that some of these species have such a restricted range.

The males are best distinguished by the genitalia, otherwise the species may be separated as follows:

| | | |
|---|---|---|
| 1. | Frons concolorous. | 2 |
| | Frons darker between eyes than below. | 5 |
| 2. | Vertex, pronotum, and scutellum lighter than frons and clypeus. | *fuscifrons* |
| | Vertex, pronotum, and scutellum not lighter than frons and clypeus. | 3 |
| 3. | Veins on tegmina apparently white, sparsely granulated. | *vastatrix* |
| | Veins on tegmina apparently dark, closely granulated. | 4 |
| 4. | Median, radial, and cubital cells clear; longitudinal markings on femora very faint. | *amboinensis* |
| | Median, radial, and cubital cells dark; longitudinal markings on femora plainer. | *lalokensis* |

5. Spur on hind leg same color as tibia. 6
Spur on hind leg darker than tibia. 9
6. Tegmina divided into two longitudinal parts by the median, 5th cubital, and all cells posterior to them (including clavus) being dark; all anterior clear. *bicoloris*
Tegmina not so colored. 7
7. Pattern on tegmina formed by brown and yellow on clear cells. *variegata*
Pattern on tegmina formed by brown on clear cells (no yellow) 8
8. Pattern on tegmina on 5 and 6 apical cells, granules on veins pallid and fine. *saccharicida*
Pattern on tegmina on 6 and at each end of 5 apical cells, making curved pattern; granules on veins dark and coarse. *sinensis*
9. Scutellum concolorous. 10
Lateral parts of scutellum darker than middle. 11
10. Tegmina almost immaculate, some of apical veins lightly infuscate; granules inconspicuous and very sparse. *vitiensis*
Tegmina with granulation darker and coarser (all females brachypterous). *graminicida*
11. Antennae concolorous, dark. *papuensis*
Antennae not concolorous. 12
12. Head and thorax light, veins on tegmina sparsely and finely granulated. *pallidula*
Head and thorax dark, granules on tegminal veins closer and coarser. *rattlei*

1. *saccharicida* Kirkaldy, 1903, Entom. XXXVI., 179.

I have one male specimen from Viti Levu, Fiji, probably imported from Queensland with cane. It is possible that New Guinea species will eventually be recorded from the same locality, as much sugar cane has been imported direct from that locality.

2. *vitiensis* Kirkaldy, 1906, Bull. H. S. P. A. Ent. I, 406.

3. *graminicida* Kirkaldy, 1906, Bull. H. S. P. A. Ent. I., 406.

4. *sinensis* Kirkaldy, 1907, Bull. H. S. P. A. Ent. III., 138.

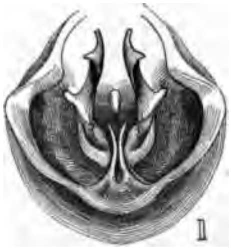
I have one macropterous female specimen from Telok Ayer, West Borneo, that agrees with the Chinese males, except that the dark mark runs down apical cell 6 instead of 5.

### 5. *pallidula* sp. nov.

Female macropterous. Antennae, frons between eyes, clypeus, lateral edges of pronotum, and scutellum, light brown; frons below eyes, vertex, pronotum, and scutellum between lateral keels, and rest of thorax and legs yellowish. Pleural spot very faint. Anterior and intermediate tarsi, band on anterior and intermediate femora, and spur, blackish. Abdomen, yellowish. Tegmina, hyaline; clavus, light brown; dorsum, white with dark spot before end of anal vein; dark brown at base and near apex of 5, and greater part of 6 and 7 apical cells, leaving a light spot near apex of these cells; veins, light, sparsely studded with brown granules. Length of female 3 mm, 4 mm.*

Habitat, Pontianak, Borneo, on sugar cane. This comes near to P. *sinensis*, but I have specified it, as it is much more uniform and light in color. The presence of a dark band on the femora, and not longitudinal marks, and the black spur distinguish it. The granules on veins are less distinct than in *sinensis*, but more so than in *saccharicida*.

### 6. *rattlei* sp. nov. (Fig. 1.)



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*First measurement front of vertex to end of abdomen, second measurement to end of tegmina.

Male macropterous. Head, antennae, and thorax, brown; frons between eyes, clypeus, lateral edges, pronotum, scutellum, and distal part first antennal joint, darker; keels and spots on frons, lighter. Anterior and intermediate tarsi, band on tibiae and spur, dark; also longitudinal marks on femora, pleural spot, plain. Dorsum, inner margin or edge of clavus, abdomen, black with brown markings along sides. Tegmina, hyaline, suffused with light brown. Radial and median cells, dark brown, running into central part of subcostal cell. Apical cells 2 to 8, dark brown with light spots in 2 to 4 and 6 to 7, also in radial and median. Veins closely granulated. Anal tube with claw-like, curved spine; genital styles, large antler-like, reaching beyond middle of pygophor, basal part thick and slightly concave, with small protuberance in middle, distal part flattish provided with blunt prong on outer side and apex drawn out into two flat prongs. Ventral spines, thin, smooth, cone-shaped, curved, touching in center, but not at base or tips.

Female macropterous, somewhat lighter in color than male, especially the abdomen. Dark marks on tegmina confined to along the apical veins, especially the distal part, and along base of 5 to 6 apical cells. Length, female, 4.5 mm, 6 mm; male broken.

Habitat, Laloki River, British New Guinea, on sugar cane.

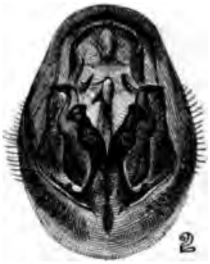
This species comes near to *lalokensis* and *amboinensis*, but the light frons below the eyes makes it easy to distinguish.

### 7. *bicoloris* sp. nov.

Female macropterous. Antennae, frons between eyes, clypeus, lateral margins of pronotum, and scutellum, piceous brown, with light spots on frons; frons between eyes and apex of clypeus, white, with dark sub-apical line across former; vertex and pronotum and scutellum between lateral keels, yellowish. Legs, light; posterior and intermediate tarsi and band on tibiae, piceous, with longitudinal markings on femora. Pleural dark spot, plain. Abdomen, dark, marked with light brown. Tegmina, hyaline; dark on clavus; median, discoidal and 5 to 6 apical cells, dark along 1 to 4 apical veins. Veins finely granulate. Only females taken, length 3 mm, 5 mm.

Habitat, Laloki River, British New Guinea, on sugar cane.

### 8. *variegata* sp. nov. (Fig. 2.)



Male macropterous. Vertex, pronotum, and scutellum, yellowish brown, broadly whitish along keels; antennae, frons between eyes, and clypeus brown, former with light spots; frons below eyes and apex of clypeus, white. Legs, white; anterior and intermediate tarsi and band on tibia, dark; dark longitudinal mark on femora; spur, light. Pleural spot, small. Abdomen, piceous, marked with brown. Tegmina, hyaline; yellowish between dorsum and axillary veins and across distal part of subcostal cell; between anal and axillary veins, basal half of median and spreading into radial, 5 to 8 apical cells, also along apical vein 2 to 4, dark brown; white spot at edge of 5 to 7 and across middle of 5 apical cells. Veins, light, granules exceedingly fine and sparse. Anal spines curved, pointing distally. Genital styles large, reaching past middle of pygophor, horn-shaped and twisted, without any lateral prongs. Ventral spines large, reaching about to middle of pygophor, sub-cylindrical and rounded at ends, swollen about middle, from which point they divaricate. The pattern on wings and large ventral spines distinguishes this species.

Female macropterous, similar to male, except the abdomen, which is lighter. Length: male 2.5 mm, 4 mm; female, 3.5 mm, 5 mm.

Habitat, Laloki River, British New Guinea, on sugar cane.

### 9. *papuensis* sp. nov.

Female macropterous. Antennae, frons between eyes, clypeus, lateral edges of pronotum and scutellum, black, with light spots on frons between eyes; frons below eyes and apex of clypeus, white; sub-apical dark marks between keels on frons; vertex, pronotum, and scutellum, yellowish between white keels. Legs, whitish; anterior and intermediate tarsi, band on tibiae, and spur, black; dark longitudinal marks on femora. Large black pleural spot. Abdomen, black. Tegmina, hyaline, suffused with brown on clavus; dorsum, white; black dot at end of anal vein; apical cells 5 to 8, and running into discoidal and median cells, dark brown, also along apical veins 1 to 4; white spot at apex of 5 to 8, and center of 5, apical. Veins, thickly studded with dark granules.

This is a very distinctly contrasted species represented only by a female. Length, 3.5 mm, 6mm.

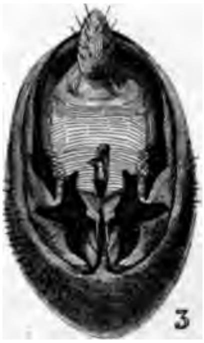
Habitat, Laloki River, British New Guinea, on sugar cane.

### 10. *vastatrix* (Breddin).

I have specimens of both sexes of this species from Java, West Borneo, Amboina, Piroe (Ceram), and Laloki River (British New Guinea). There is a distinct darkening of the wing pattern as we pass eastward.

The spine on anal tube is bifurcate.

### 11. *lalokensis* sp. nov. (Fig. 3.)

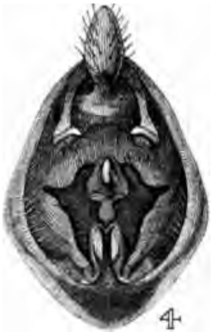


Males macropterous. Head, antennae, thorax, and legs, brown, with small lighter spots on frons. Apex of first antennal joint, black. Lateral margins of pronotum and scutellum, dark. Large, black pleural spot. Anterior and intermediate tarsi, and apex of tibiae, banded with black. Tegmina, hyaline, suffused with brown. Dorsum, white to end of clavus; black spot on apex of anal vein. Apical cells 4 to 8, and along apical veins 1 to 3, dark brown, continuing into distal part of radial, median, and inner discoidal cells; light spot in distal cells 6 to 8. Veins, dark, finely granulated. Anal tube large, with a pair of straight, somewhat bulbous spines reaching beyond middle of pygophor. Genital styles, broad, flattish, distal end cut off square, outer edge giving out blunt prong half way down and inner edge small blunt knob. Ventral spines, thin, touching from base to tip.

Female dimorphic, macropterous forms similar to male, excepting abdomen which is lighter; brachypterous forms lighter with the spot at apex of anal vein and a spot at end of radial cell. Length, males 3 mm, 5 mm; females, 5 mm, 6 mm; brachypterous females 4.5 mm, 4 mm.

Habitat, Laloki River, British New Guinea, on sugar cane.

### 12. *amboinensis* sp. nov. (Figs. 4 and 5.)



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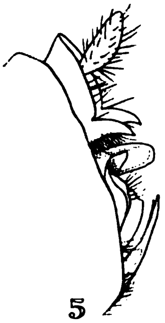

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Males macropterous, markings on head and thorax similar to *lalokensis*, but lighter, especially the legs. Tegmina, brownish hyaline. Apical cells 4 to 7 and base of 3 dark. also along apical veins 2 to 3, light spot in apical cells 4 to 7. Dorsum, whitish to end of clavus, spot at end of anal vein, faint. Veins, dark, finely granulated.

Pygophor approaching *lalokensis,* anal tube with a pair of curved, claw-like spines pointing distally. Genital styles, broad, flattish; distal end and prong on outer edge less square than in *lalokensis.* Ventral spines, thin, diverging near apex.

Female macropterous; tegmina often slightly darker than male; light spot in apical cell 4 sometimes missing. Length, male, 3 mm, 4.5 mm; female, 4 mm, 6 mm.

Habitat, Island of Amboina, on sugar cane.

### 13. *fuscifrons* sp. nov.

Pronotum and scutellum, light brown, darker on lateral edges, keels whitish. Vertex and frons, brown, slightly lighter between eyes than below; keels, small spots on frons, and a line across apex, whitish; clypeus darker than frons. Front and intermediate tarsi and bands on tibiae, dark; femora, dark. Black pleural spot. Tegmina, hyaline, yellowish between axillary vein and dorsum; dark spot at end of anal vein; dark along tips of apical veins; base of apical cell 5 and across apical cell 6. Only females taken. Length, 2.5 mm, 4 mm.

Habitat, Island of Amboina, on sugar cane.

The frons and clypeus darkening towards the apex, together with the light dorsal and dark ventral aspect, distinguishes this species.

## PHACALASTOR.

*Phacalastor pseudomaidis* Kirkaldy, 1906, Bull. H. S. P. A. Ent. I. 408, was placed by its author in the genus *Perkinsiella* (1907 Bull., H. S. P. A. Ent. III., 136, Plate XIII., Figs. 1-2) on account of the pair of ventral spines, but the specimen examined and figured had the oedeagus abnormally extruded and laying on the prolongation of the ventral edge of the pygophor, the two spines seen belong to the oedeagus. This pygophor is of the same type as *P. koebelei* Kirkaldy, so I place them together again in that genus.

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**DIVISION OF ENTOMOLOGY** **BULLETIN No. 8**

REPORT OF WORK
OF THE
# EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

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# A Bibliography of Sugar-Cane Entomology

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By G. W. KIRKALDY

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HONOLULU, HAWAII
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DIVISION OF ENTOMOLOGY BULLETIN No. 8

REPORT OF WORK
OF THE
EXPERIMENT STATION
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HAWAIIAN SUGAR PLANTERS' ASSOCIATION

# A Bibliography of Sugar-Cane Entomology

By G. W. KIRKALDY

HONOLULU, HAWAII
DECEMBER, 1909

# LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the
Hawaiian Sugar Planters' Association,
Honolulu, Hawaii.

Gentlemen:—I herewith submit Bulletin VIII of the Division of Entomology. It has been prepared by myself, and is entitled "A Bibliography of Sugar Cane Entomology."

Yours obediently,

G. W. KIRKALDY,
Acting Director, Division of Entomology.

Honolulu, Hawaii,
September 1, 1909.

This bibliography is intended primarily as a work of reference for the Entomologists of the Hawaiian Sugar Planters' Association.

It is probable that some references have been overlooked, though it is not likely that these are of special value; on the other hand, a considerable number of apparently worthless notes have been included, because it is impossible, beforehand, to draw any line between them and those which will prove important locally.

The bulletin is divided into two parts.

(a) A list of works, arranged under authors;

(b) A preliminary list of the insects, spiders, etc., of the sugar cane fields.

† indicates that the work has not been accessible.

* * indicates that the work is private and has been distributed only to the members of the Hawaiian Sugar Planters' Association.

[ . . . ] means that there is no special title to the paper, or that I have not seen it.

* (in part 2) indicates a Hawaiian species.

As the bulletin is merely a working list and not intended to serve as a complete bibliography, many of the titles are abbreviated, the lacunae being shown by " . . . . " In the precis, the original name is usually given.

The numbers, after the author's names in the second part, refer to part 1.

# PART I.

## A LIST OF AUTHORS.

**ALCOCK, A.:**

1. "\.... Pests of the Sugar Cane," Ind. Mus. Notes V. 40-4 (1900).

**AVEQUIN, J. B.:**

1. [Enemies of Sugar Cane in Antilles and Louisiana], Journal Pharmacie, XXXII. 335-7 (1857).
   Cf. Ins. Life IV. 96 (1891 Nov.)
   Diatraea saccharalis and Calandra

**BANCROFT, J.:**

1. † Second Ann. Rep. of Board appointed to enquire in the causes of Diseases affecting live stock and plants, &c." (Brisbane 1877) pp. 12-13, figs.
2. † Diseases of animals and plants that interfere with Colonial Progress" (Brisbane 1879), pp. 8-9.
3. † "Rep. of the Board appointed to enquire into the causes of diseases affecting live stock and plants" (Brisbane 1876) pp. 19-31, 2 Pls.

**BALLOU, H. A.:**

1. "Review of Insect Pests Affecting the Sugar Cane," West Ind. Bull. V. 37-47 (1905).
   Reprint Haw. Pl. Mo. XXIV. 267-74 (1905 June 15).
   Diatraea saccharalis; Ligyrus tumulosus; Sphenophorus sericeus; Diaprepes abbreviatus; Delphax saccharivora; Xyleborus perforans; Castnia licus; Coccidae; and Parasites.

**BARLOW, E.:**

1. "Miscellaneous Notes from the Entomological Section," Ind. Mus. Notes IV. 35-6 (1896).
   Aspidiotus; Termes taprobanes.

**BARRETT, O. W.:**

1. "The Changa or Mole Cricket (*Scapteriscus didactylus* Latr.) in Porto Rico." Bull. Porto Rico Agr. Station. II. 1-9, fig. 1 (1902).
   [Reprint Haw. Pl. Mo. XXIII. 222-37, fig. 1 (194)].

**DE BARRY:**

1. † "Mémoires sur les Fourmis de Canne à Sucre," (Paris) pp. 1-18 (1785).
2. † "Le Bréton's Traité sur les Propriétés et les Effects du Sucre" (Paris) pp. 157-84 (1789).

**BECKFORD ,W.:**

1. † "Descriptive Account of the Island of Jamaica," II. 52-4 (1790).
   Diatraea saccharalis.

**BLANDFORD, W. F. H.:**

1. "Notes on Scolytidae and their Food-Plants," Ins. Life, VI. 260-5 (1894 Feb.).
   Xyleborus perforans; Hypothnemus eruditus.
2. "The Identity of *Xyleborus affinis*," Ent. News. IX. 3-6 (1898, Jan.).

**BOJER, W.:**

1. † "Report of the Select Committee Appointed to Examine the Extent of the Damage Done by the Cane Borer in Mauritius," pp. 1-21, Pls. I-V (1856).
   Diatraea saccharalis [as Proceras sacchariphagus]
   [Reprint in Sugar Cane, V. 477-83, (1873, Sept.) and 534-7 (Oct. 1), 3 Pls.].

**BERG:**

1. † [*Pulvinaria iceryi*], Soc.d'Acclim. IX. 939 (1862).

**BORDAGE, E.:**

1. † "Sur deux Lepidopterés Nuisibles à la Canne à Sucre aux Iles Mascareignes," C. R. Ac. Sci France, 1109-1112 (1897).
   Diatraea saccharalis; Sesamia nonagrioides.
2. † [Ichneumonid parasites of the Sugar Cane Borer in the Island of Réunion]. [source?]
   Ophion mauritii and antankarus on Diatraea striatalis and Sesamia albiciliata.
   [Résumé Bull. U. S. Ent. XXX. 82, fig. 29 (1901)].

**BOS, H.:**

1. † "Een vijand van het Suikerriet, *Apogonia destructor* nov. spec.", Tijdschr. Ent. XXXIII. 311-48, 2 Pl. (1890).

**BREDDIN, G.:**

1. "Javanische Zuckerrohrschädlinge aus der Familie der Rhynchoten," Deutsche Ent. Zeitschr. XL. 105-10 (1896, May).
   Colobathristes sacchariclda; Periscopus mundulus; Dicranotropis vastatrix; Eumetopina krügeri.

**BRICK, G.:**

" † . . . Einige Krankheiten und Schädigungen tropischer Kulturpflanzen ( . . . des Zuckerrohrbohrers, *Diatraea saccharalis*, in Guatemala)," Ber. Stat. Pflanzenschutz Hamburg X. 223-58 (1909).

**BROWNE, P.:**

1. † "The Civil and Natural History of Jamaica," Ed. 1, 1756; Ed. 2, 1789,
   p. 430 Aphis

**BUSCK, A.:**

1. "Notes on a Brief Trip to Puerto Rico," Bull. U. S. Ent. 22, pp. 88-92 (1900).
   Dactylopius sacchari.

**BUTLER, A. G.:**

1. "Heterocerous Lepidoptera Collected in Chili," T. E. S. London, 113-39 (1882).
   115 Leucania saccharivora.

**CALDWELL, J.:**

1. † "Report on New Caledonia" (Mauritius 1870) 11 pp.
   "Locusts."

**CAMERON, C. A.:**

1. † "Sugar: Its Composition, &c.," (Dublin 1863, 30 pp.).
   Acarus sacchari.

**CASTLES, J.:** .

1. † "Observations on the Sugar Ants," Phil. Trans. Roy. Soc., London, LXXX. 346-58 (1790).
   [Also in Voight Mag. VIII. St. 3, pp. 90-100].
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**CHAMPION, G. C.:**

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**CHARMOY, DE:**

1. † "......," Pr. Soc. Am. Sci [?Mauritius] 45-7 (1899).
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**COCKERELL, T. D. A.:**

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   Diatraea saccharalis.
2. "A list of West Indian Coccidae," J. Inst. Jamaica I. 252-6, Pl. (1893 Apr.).
   255 Aspidiotus sacchari.
3. "Report on infected Sugar Canes," Bul. Bot. Dep. Jamaica XL. 6. (     ).
   Dactylopius.
4. "The distribution of Coccidae," Ins. Life VI. 99-103 (1893 Dec.).
   103 Aspidiotus sacchari.
5. "*Aspidiotus sacchari* in Java," Ent. News XIII. 24 24 (1902 Jan.) (*)

**COMPERE, G.:**

1. "Return of Mr. G. Compere," J. Agr. W. Australia, XVII. 268-70 (1909 April)
   269-70, severe criticism of Froggatt No. 3.
   [Abstract Haw. Pl. Mo. XXVII. 176-8 (1909 May)].

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* I have also unseen references to
(a) Bull. Bot. Dep. Jamaica 50 (1897); Bull. U. S. Ent. Techn. VI. 25 (1897) relating to *Aspidiotus sacchari*.
(b) J. Trinidad Nat. Club II. 195 (1895) relating to *Dactylopius sacchari*.
(c) Pr. Ac. N. Sci. Philadelphia. 266-74 (1899), on Coccidae.

**COMSTOCK, H. H.:**

1. "Report on Insects Injurious to Sugar Cane," Spec. Rep. Dep. Agric. U. S. 35. pp. 1-11 (1881).
   3-8 Ligyrus rugiceps, text. figs. —; 8-11 Chilo saccharalis, text figs.
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   Diatraea saccharalis. Pl. II.

**COOK, M. T.:**

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**COQUILLETT, D. A.; and JAEGER, A.:**

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   Does not attack sugar cane.

**COTES, E. C.:**

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   152 Xyleborus perforans: 156 Mancipium nepalensis; 159 Achaea melicerte; 162 Termes taprobanes; 162 Dragana pansalis; and Diatraea saccharalis; 170 Oedalus marmoratus; 161 Poecilocera hieroglyphica.
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   Sugar Cane Pests, 100-1.
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2. "Contributions Toward a Monograph of the Oriental Aleurodidae," J. Asiat. S. Bengal LXXII (2) 61-98, (1903, Sept. 12).
   92 A. barodensis.

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pp. 43-61, (1905); and Hawaiian Planters' Monthly XXIII. pp. 488-513, Nov. 1904 (publ. Dec.); summaries or reviews in Allg. Zeitschr. Ent. IX. 85-6 (1904); Exp. Sta. Rec. XV. 488-9 (1904); cf. Haw. For. I. 139.

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   Prt. 2, Bull. H. S. P. Ent. I. 71-85, figs. Lepidoptera, 1905 June;
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   Prt. 8, Bull. H. S. P. Ent. I. 239-67, Pls. 18-20, Hymenoptera, 1906 Jan.;
   Prt. 10, Bull. H. S. P. Ent. I. 481-99, Pls. 33-8, Hymenoptera, Diptera, 1906 March.

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* This bulletin (including Parts 5, 7, and 9 by Terry, Swezey, and Kirkaldy, q. v.) has been reviewed, partly or entirely, in (among others):

Ent. Mo. Mag. (2) XVI. 263-4 (1905) (by Saunders).
Zeitschr. Pflanzenkr. XVI. 296 (1906).
Nature LXXXV. 82 (1906).
Exp. Sta. Rec. XVII. 477 (1906) et seqq.
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[illegible] Microlépidoptères [illegible] à la Canne à [illegible]" A. & E. [illegible]

[illegible]" [illegible] (1881).

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   p. 240. **Diatraea saccharalis.**

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57 Spodoptera mauritia on cane.
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8. "Notes on the Bud Moth of Sugar Cane and Its Lepidopterous Associates," H. Pl. Rec. I. 119-43, Pls. 1-4 (1909 Sept.).
9. "The Hawaiian Sugar Cane Bud Moth (*Ereunetis flavistriata*). With an Account of Some Allied Species and Natural Enemies," Bull. H. S. P. Ent. VI. 1-41, Pls. 1-4 (1909 Oct. 25).
10. "Army Worms and Cut Worms on Sugar Cane in the Hawaiian Islands," op. cit. VII. 1-32, Pls. 1-3 (1909 Nov.).

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3. "Lecture on Cane-borer," H. Pl. Mo. XXVI. 436-40, (1907 Nov. 15).
   **Sphenophorus obscurus.**
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   793-801 Hispella wakkeri, Pl. I, Figs. 1-12; 799 Eulophus femoralis Figs. 13-16; 801 Aphanisticus krügeri; Cosmopteryx sp.; Phytomyza sp.
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9. "De Kentjong-Kever," Arch. Java Suik. V. 23-4 (1897).

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14. De plentenluizen van het Suikerriet op Java IV," Arch. Java Suik. V. 735-44, Pl. 8. (1897).
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16. "De Mineerlarven van het Suikerriet op Java II-III," Arch. Java. Suik. V. 979-992, Pl. (1897).
[Reprinted as Med. Oost Java No. 42].
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17. "*Heteronychus sp?* I. De Kentjong-Kever," Arch. Java. Suik. VI. 337-42, Pls. 8, Fig. 1-14. (1898).

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Paras. 249-54 Botrytis; 354-9 Masicera, Pl. 8. Figs. 16-19.
[Reprinted as Med. Oost Java No. 47].

18. "Shotborer," Arch. Java Suik. VI. 586-7. (1898).

19. "Levenswijze en bestrijdning der boorders V.," Arch. Java Suik. VI. 673-82, Pl. 12. (1898).

[Reprinted as Med. Oost Java (3) III and Med. W
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673-9 Sesamia nonagrioides var. albiciliata, Pl. 12, figs. 1-
679-81 Bandongboorder, Pl. 12, Figs. 12-15.

20. "De Mineerlarven van het Suikerriet op Java IV
Arch. Java Suik. VI. 793-807, Pl. 13. (1898).

Cosmopteryx pallisfasciella; Chalcis; Bracon; Pleurotropis t
racica; Derostenus albipes; Closterocerus.

[Reprinted as Med. Oost Java (3) IV].

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Arch. Java Suik. VI. 1085-98, Pl. 14. (1898).

1085-90 Chionaspis madiunensis, Pl. 14, figs. 1-9; 1089 Phys
flavidus figs. 11-16; 1090-3 Chionaspis tegalensis, figs. 17-
1094-7 Chionaspis sp.; fig. 10, egg of Chionaspis saccharifo

[Reprinted as Med. Oost Java No. (3) 6, and Me
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22. "Over eenige insektenplagen bij de Rietkultuur
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23. "De Plantenluizen van het Suikerriet op Java VIII,"
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445-59 Aleurodes longicornis Pl. I; and 459-64 lactea. Pl. 2,
figs. 15-17, and 462 Encarsia (Hym), Pl. 2, figs. 18-19.

[Reprinted as Med. West. Java No. 38].

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[Reprinted as Med. West Java No. 44].

26. "Nieuwe parasiten der boorders," Arch. Java Suik.
VIII. 773-85. Pl. 7. (1900).

733 Elasmus, Pl. 7, Figs. 1-4; 449 Braconid Figs. 10-12; 776
Macrocentrus Figs. 5-8; 781 Braconid, Figs. 13-14.

[Reprinted as Med. West Java No. 46].

27. "De Plantenluizen van het Suikerriet op Java X,"
Arch. Java Suik. VII. 1013-44, Pls. 8-9. (1900).

[Reprinted as Med. West Java 49].

1013 Ceratovacuna lanigera, Pl. 8 figs. 1-4, and Pl. 8 figs. 17-
18; 1024 Encarsia? flavoscutellum figs. Pl. 8. 5-6 and Pl. 9.
figs. 17-18; 1025 Chrysopa sp. 1, Pl. 9, fig. 34; 1030 Osmylus
sp. Pl. 8, figs. 7-10; 1032 Pteromalid gen. and sp? figs. 11-13;

1033 Coccinellid sp? Pl. 9, figs. 19-23; 1036 Ephestia cautella Pl. 8. figs 14-16;1038 Tetrastichus, Pl. 9, figs. 26-27; 1040 Halticella, Pl. 9, figs. 24-25.

28. "De Mijten van het Suikerriet op Java 1," Arch. Java Suik. IX, 193-209. Pls. 1-2.

[Reprinted as Med. West Java 51].

29. "De Plantenluizen van het Suikerriet op Java, XI and XII," Arch. Java Suiker. IX. 577-94, Pl. 7-8. 1901).

577-82 Aspidiotus, Pl. 7, figs. 1-13; 582-91 Planchonia Pl. 8; Hym. parasites. 591 Apheline? Pl. 7, figs. 16-18; Encyrtine, Pl. 7, figs. 14-15.

[Reprinted as Med. West. Java 52].

30. "De Planzenluizen van het Suikerriet op Java, XIII," Arch. Java Suiker. IX. 673-94, Pls. I and II. (1901).

673-86 Aphis sacchari Pl. 9, figs. 1-10 and 686-8; adusta, Pl. 10 figs. 25-8; 688 Tetraneura lucifuga Pl. 10 figs. 29-34; 681 Aphelinus mali, Pl. 10, fig. 21; 679 Encyrtine sp. figs. 22-24; 683 Syrphid, Pl. 10, figs. 17-20.

[Reprinted as Med. West Java No. 53].

31. "Methode der Boorderbestrijding," Ed. 3, Proef. Suik. West Java Pekalongan, pp. 1-27, Pls. I and II. (1901).

Diatraea, Scirpophaga, Chilo, Grapholitha.

# PART II.

# A LIST OF SUGAR CANE INSECTS, SPIDERS, ETC.

## ORDER NEUROPTERA.

* *Anomalochrysa decepta* (Hemerobiidae).
Terry 2.
* *A. gayi.*
Terry 2.
* *A. raphidioides.*
Terry 2.
* *Chrysopa microphya* (Hemerobiidae).
Perkins 1; Swezey 4; Terry 2.
*C. spp.*
Deventer 4; Zehntner 27.
* *Nesomicromus vagus* (Hemerobiidae).
Perkins 1.
*Osmylus sp.* (Osmylidae).
Deventer 4; Zehntner 27.

## ORDER ORTHOPTERA.

### (Including Pseudoneuroptera).

*Acheta bimaculata* [*Liogryllus*] (Gryllidae).
Deventer 4; Koningsberger 1; Krüger 3; Zehntner 13.
*Acrydium aeruginosum* (Acrydiidae).
Deventer 4.
*A. luteicorne.*
Deventer 4; Koningsberger 1; Krüger 3; Zehntner 13.
*A. roseum.*
Deventer 4; Koningsberger 1; Krüger 3; Zehntner 13.
*A. zehntneri.*
Deventer 4; Koningsberger 1; Krüger 3; Zehntner 13.
* *Allacta notulata* [*Phyllodromia hieroglyphica*] (Blattidae)
Perkins 1.
* *Anisolabis annulipes* (Forficulidae).
Perkins 1; Terry 2.
*Atractomorpha crenulata* (Acrydiidae).
Deventer 4; Koningsberger 1; Krüger 3.

*A. psittacina.*
Deventer 4; Koningsberger 1; Krüger 3; Zehntner 13.
*Atropos sp.* (Psocoptera).
Roth 1.
* *Chelisoches morio* (Forficulidae).
Lucas 1; Perkins 1; Terry 2.
* *Conocephalus latifrons* [*Anisoptera; Xiphidium*]. (Locustidae).
Swezey 1.
* *C. varipennis.*
Eckart 1; Perkins 1; Swezey 1. 3.
*Elimaea chloris* (Locustidae).
Deventer 4; Koningsberger 1; Krüger 3; Zehntner 13.
*Epacromia tamulus* (Acrydiidae).
Deventer 4; Koningsberger 1; Krüger 3.
* *Gryllotalpa africana* (Gryllidae).
Deventer 4; Eckart 1; Koningsberger 1; Krüger 3; Zehntner 13.
*G. didactyla,* vide Scapteriscus.
*Hieroglyphus furcifer* (Acrydiidae).
Hadi 1; Lefroy 7.
* *Labia pygidiata* (Forficulidae).
Perkins 1; Terry 2.
* *L. sp.?*
Perkins 1; Terry 2.
* *Labidura sp.?* (Forficulidae).
Terry 2.
*Liogryllus* vide Acheta.
*"Locusts."*
Caldwell 1.
*Mecopoda elongata* (Locustidae).
Deventer 4; Koningsberger 1; Krüger 3; Zehntner 13.
*Oedalus marmoratus* (Acrydiidae).
Cotes 2; Deventer 4; Stebbing 1.
* *Oxya velox* (Acrydiidae).
Deventer 4; Eckart 1; Koningsberger 1; Krüger 3.
*O. sp.?*
Deventer 4.

*Phaneroptera sp.?* (Locustidae).
Deventer 4; Krüger 3.
*Phyllodromia hieroglyphica,* vide Alacta notulata.
*Poecilocera hieroglyphica* (Acrydiidae).
Cotes 2; Hadi 1; Stebbing 1.
* *Psocidae.*
Perkins 1.
*Scapteriscus didactylus* (Gryllidae).
Barrett 1; Johnstone 3; Kirby and Spence 1.
*Sphingolabis taeniata* (Forficulidae).
Koebele 4.
*Termes gilvus* (Isoptera).
Deventer 4; Krüger 3.
*T. taprobanes.*
Alcock 1; Barlow 1; Cotes 1, 2; Hadi 1; Lefroy 7; Peal 1; Stebbing 1.
*T. spp.*
Koningsberger 1; Zehntner 13.
* *Tenodera sinensis* (Mantidae).
Kirkaldy 17.
*Trilophidia annulata* (Acrydiidae).
Deventer 4; Koningsberger 1; Krüger 3.
*T. cristella.*
Deventer 4; Koningsberger 1; Krüger 3.
*Truxalis spp.* (Acrydiidae).
Deventer 4.
*Xiphidion* and *Xiphidium,* vide Conocephalus.
X. *fuscum,* vide Conocephalus varipennis.

## ORDER THYSANOPTERA.

*Heliothrips striatoptera.*
Deventer 4; Koningsberger 1; Krüger 3.
*Oxythrips binervis.*
Deventer 4; Koningsberger 1; Krüger 3.
*Parthenothrips kobusi.*
Deventer 4.
*Phloeothrips amphicincta.*
Krüger 3; Zehntner 13.

*P. lucasseni.*
Deventer 4; Koningsberger 1; Krüger 1, 3.
*Physopus sexnotatus.*
Deventer 4; Koningsberger 1; Krüger 3; Zehntner 13.
*Stenothrips zehntneri.*
Deventer 4.
*Thrips minuta.*
Deventer 4.
*T. sacchari.*
Deventer 4; Koningsberger 1; Krüger 1, 3.
*T. serrata.*
Deventer 4; Koningsberger 1; Kobus.

## ORDER HEMIPTERA.

*Agonoscelis nubilis* (Cimicidae).
Nicéville 2.
*Aleyrodidae* (general).
Kirkaldy 8; Peal 1.
*Aleyrodes barodensis* (Aleyrodidae).
Lefroy 7; Maskell 2, 6; Peal 2; Stebbing 1.
*A. bergi* [=*berghii*].
Guérin 1; Kirkaldy 4; Koningsberger 1; Krüger 3;
Muir 1; Signoret 1; Zehntner 7, 13.
*A. lacteus* [= — *tea*].
Koningsberger 1; Krüger 3; Zehntner 13, 23.
*A. longicornis.*
Koningsberger 1; Krüger 3; Zehntner 11, 13, 23.
*A. sacchari.*
Kirkaldy 4; Maskell 1.
*Anthocoris pacificus* (Anthocoridae).
Kirkaldy 4.
*Antonina sp?* [= *Planchonia sp*]. (Coccidae).
Koningsberger 1; Zehntner 1, 3, 29.
*Aphidae* (general).
Browne 1; Kirby and Spence 1; Morris 1; Went 1;
Zehntner 11.
*Aphis* vide Loxerates.
*Aspidiotus glomeratus*, vide Targionia.

*A. sacchari.* (Coccidae).
Cockerell 2 &c.; Lefroy 8; Leonardi 1.
*A. saccharicaulis*, vide Odonaspis.
*A. spp.*
Barlow 1; Zehntner 29.
*Astorga sacchariceida* (Fulgoridae).
Kirkaldy 2.
*Belus*, vide Zelus.
*Blissus gibbus* (Myodochidae).
Alcock 1; Distant 2; Hadi 1; Peal 1; Stebbing 1.
*B. leucopterus.*
Koebele 4.
*Brachyplatys pacifica* (Cimicidae).
Kirkaldy 4.
*Ceratovacuna*, vide Oregma.
*Cicadula euryphaessa* (Tetigoniidae).
Kirkaldy 3, 4.
*Chionaspis depressa* (Coccidae).
Koningsberger 1; Krüger 3; Zehntner 8, 13.
*C. madiunensis.*
Zehntner 21.
*C. saccharifolii.*
Koningsberger 1; Krüger 3; Zehntner 8, 13, 21.
*C. tegalensis.*
Zehntner 21.
*C. sp.*
Kotinsky 2.
*Coccidae* (General).
Ballou 1; Fernald 1; Hooker 1; Lefroy 5; Signoret 2.
*Coccus sacchari*, vide Icerya seychellarum.
*C. sinensis* (Coccidae).
Walker 1.
*Colobathristes*, vide Phaenacantha.
*Conorhinus*, vide Triatoma.
*Cyrtodisca major* (Tetigoniidae).
Koebele 4.
*C. sp.*
Koebele 4.

*Cyrtorhinus mundulus* (Miridae).
Breddin 1; Deventer 4; Kirkaldy 4; Koningsberger 1; Krüger 3; Zehntner 13.
*Dactylopius*, vide Trechocorys.
*Dicranotropis vastatrix*, vide Perkinsiella.
*Dictyophora pallida*, vide Pyrilla aberrans.*
*Diplorhinus furcatus* (Cimicidae).
Ellenrieder 1.
*Eosaccharissa javana* (Fulgoridae).
Kirkaldy 5.
*Eumetopina krügeri* (Asiracidae).
Breddin 1; Deventer 4; Koningsberger 1; Krüger 3; Perkins 1; Zehntner 13.
* *Fulvius peregrinator* (Miridae).
Kirkaldy 11.
*Heronax saccharivora* (Derbidae).
Kirkaldy 2.
*Icerya seychellarum* [=*Dorthesia seychellarum* = *Coccus sacchari, &c.*], (Coccidae).
Charmoy 1; Coquillett 1; Delteil 1; Guérin 1; Hartmann 1; Howard 6; Krüger 3; Maskell 5; Riley and Howard; Roth 1; Signoret 1, 2; Westwood 3a.
*"Lecanium" guerinii* (Coccidae).
Guérin 1; Signoret 1.
*L. iceryi*, vide Pulvinaria.
*"L." krügeri.*
Koningsberger 1; Krüger 3; Zehntner 13.
*Loxerates adusta* (Aphidae).
Köningsberger 1; Krüger 3; Zehntner 13, 30.
* *L. sacchari.*
Eckart 1; Kirkaldy 7; Köningsberger 1; Krüger 3; Perkins 9; Zehntner 13, 20.
*Nesosteles hebe* (Tetigoniidae).
Kirkaldy 4.
*Ninus stylatus* (Myodochidae).
Kirkaldy 4.

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* According to Distant, the true *Dictyophora pallida* is found on Sugar Cane.

*Odonaspis secreta*, var. *saccharicaulis* [*Aspidiotus*] (Coccidae).
Köningsberger 1; Krüger 3; Zehntner 10, 13, 14.
* *Oechalia grisea* (Cimicidae).
Kirkaldy 12, 14; Perkins 1; Swezey 1, 3.
* *O. kaonohi*.
Kirkaldy 4.
*Oliarus saccharicola* (Fulgoridae).
Kirkaldy 3, 4.
*Oregma lanigera* [*Ceratovacuna*] (Aphidae).
Köningsberger 1; Krüger 3; Zehntner 13, 27, 30.
* *Peregrinus maidis* (Asiracidae).
Eckart 1; Kirkaldy 2, 5, 6.
*Periscopus*, vide Cyrtorhinus.
*Perkinsiella pseudomaidis* (Asiracidae).
Kirkaldy 2, 4.
* *P. saccharicida*.
Craw 5; Eckart 1; Kirkaldy 1, 2, 3, 5; Muir 3; Perkins 1, 2, 9; Van Dine 1.
*P. sinensis*.
Kirkaldy 1.
*P. vitiensis*.
Kirkaldy 1.
*P. vastatrix*.
Deventer 4; Breddin 1; Köningsberger 1; Kirkaldy 2, 5; Krüger 3; Muir 4, 5; Perkins 1, 9; Zehntner 13.
*P. spp*.
Muir 2, 3.
*Phaenacantha saccharicida* [*Colobathristes*] (Myodochidae).
Breddin 1; Deventer 4; Karsch 1; Köningsberger 1; Krüger 3; Zehntner 13.
*Planchonia*, vide Antonina.
*Phenice maculosa*, vide Proutista moesta and P. lumholtzi.
* *Physopleurella mundula* (Anthocoridae).
Kirkaldy 15; Perkins 1; Swezey 1.
*Proutista lumholtzi* (Derbidae).
Kirkaldy 1.

*P. moesta.*
Deventer; Kirkaldy 1, 5; Köningsberger 1; Krüger 3; Muir 3; Perkins 1; Zehntner 13.
*Pseudococcus*, vide Trechocorys.
*Pulvinaria iceryi* [*Lecanium*] (Coccidae).
Berg 1; Guérin 1; Icery 1; Signoret 1, 2.
*Pyrilla aberrans* (Fulgoridae).
Kirkaldy 5, 6.
*P. lycoides.*
Distant.
*P. perpusilla* [= Dictyophora pallida].
Alcock 1; Kirkaldy 5, 6; Lefroy 7; Nicéville 2; Stebbing 1.
*Pyrrhoneura saccharicida* (Derbidae).
Kirkaldy 2, 4.
*Ripersia sacchari* (Coccidae).
Alcock 1; Green 1; Stebbing 1.
* *Reduviolus blackburni* (Nabidae).
Swezey 1.
* *R. capsiformis* [= *blackburni* = *innotatus*].
Kirkaldy 9, 13; Perkins 1; Swezey 1.
*Saccharodite sanguinea* (Derbidae).
Kirkaldy 5.
*Saccharias deventeri* (Derbidae).
Kirkaldy 5.
*Saccharosydne saccharivora* (Asiracidae).
Ballou 1; Johnstone 1, 2; Kirby and Spence 1; Kirkaldy 2; Krüger 3; Lefroy 3; Westwood 1, 2, 3.
*Scaptocoris talpa* (Thyreocoridae).
Champion 1.
*Stenocranus pacificus* (Asiracidae).
Kirkaldy 2, 4.
*Targionia glomerata* [*Aspidiotus*] (Coccidae).
Green 2.
*Teleonemia sacchari* (Tingididae).
Fabricius 2.
*Tetranura lucifuga* (Aphidae).
Köningsberger 1; Krüger 3; Zehntner 13, 30.

*Tetigonia albidomarginata* (Tetigoniidae).
Kirkaldy 3.
*T. spectra* [= *albida*].
Kirkaldy 2.
*T. parthaon*.
Kirkaldy 2.
*Tomaspis* [= *Thomaspis*!] sp. (Cercopidae).
Hart 1.
* *Trechocorys calceolariae* [*Dactylopius; Pseudococcus*]. (Coccidae).
Eckart 1; Köningsberger 1; Kirkaldy 15, 17; Lefroy 8; Maskell 1.
* *T. sacchari*.
Busck 1; Charmoy 1; Cockerell 3; Green 2; Kirkaldy; 17; Lefroy 8; Maskell 4; Perkins 9.
*T. sp.*
Zehntner 13.
* *Triatoma rubrofasciata* (Reduviidae).
Kirkaldy 15; Köningsberger 1.
* *Triphleps persequens* (Anthocoridae).
Swezey 1.
* *T. pumilio*.
Kirkaldy MS.
*Tropidocephala saccharivorella* (Asiracidae).
Matsumura 1.
*Zamila*, vide Pyrilla.
* *Zelus renardii* [= *peregrinus*] (Reduviidae).
Kirkaldy 9, 15; Perkins 1, 9; Swezey 1.
*Halyomorpha guttula* (Cimicidae).
Ellenrieder 1.
*Nezara viridula* (Cimicidae).
Ellenrieder 1.
*Miscellanea.*
Köningsberger 1; Zehntner 13,

## ORDER COLEOPTERA.

* *Adoretus umbrosus* (Lamellicornia).
Deventer 4; Muir 3; Perkins 9.
*A. sp.?*
Deventer 4.
* *Aegosoma reflexa* (Longicornia).
Eckart 1; Krüger 3; Perkins 9; Terry 6.
* *Aeolus cinnamomeus* (Elateridae).
Perkins 1.
*Anomala aerea* (Lamellicornia).
Deventer 4.
* *A. atrovirens?*
Köningsberger 1.
*A. sp.?*
Deventer 4; Muir 3.
*Anoplognathus lineatus* (Lamellicornia).
Krüger 3.
*Aphanisticus consanguineus* (Buprestidae).
Deventer 4; Köningsberger 1; Krüger 3; Ritse
Zehntner 13, 16.
*A. krügeri.*
Deventer 4; Köningsberger 1; Krüger 3; Zehnt
*Aplosonyx elongatus* (Chrysomelidae).
Stebbing.
*Apogonia destructor* (Lamellicornia).
Bos 1; Deventer 4; Kobus 3; Köningsberger 1; K
3; Zehntner 5, 13, 17.
*A. ritsemae.*
Deventer 4; Köningsberger 1.
* *Aramigus fulleri* (Curculionidae).
Van Dine 2.
*Archaioneda tricolor* (Coccinellidae).
Muir.
*Aulacophora sp.* (Chrysomelidae).
Köningsberger 1.
*Calandra palmarum*, vide Rhynchophorus.
*C. sacchari*, vide Sphenophorus.
* *Callineda testudinaria* (Coccinellidae).
Swezey 1.

* *Carpophilus dimidiatus* and *maculatus* (Nitidulidae).
Perkins 1.
*Chauliognathus pennsylvanicus* (Malacodermidae).
Morgan 1.
*Chilomeles sexmaculata* (Coccinellidae).
Deventer 4.
*Cleonus superciliosus* (Curculionidae).
Köningsberger 1; Krüger 3.
* *Coccinella repanda* (Coccinellidae).
Perkins 1; Swezey 1, 4; Terry 6.
*C. sanguinea.*
Koebele 4.
*Coccinellidae spp.*
Deventer 4; Zehntner 27.
*Coelophora inaequalis.*
*Collops quadrimaculatus* (Malachiidae).
Swezey 1.
*Copris sp?* (Lamellicornia).
Deventer 4.
* *Cryptolaemus montrouzierii* (Coccinellidae).
Perkins 1; Swezey 4.
*Diaprepes abbreviatus* (Curculionidae).
Ballou 1; Watson 1.
*Dinoderus minutus* (Ptinidae).
Nicéville 2.
*Elater noctilucus* (Elateridae).
Kirby and Spence 1; Krüger 3; Say 1.
* *Elenchus tenuicornis* (Strepsiptera).
Muir 1, 2.
* *Eopenthes konae* (Elateridae).
Perkins 1.
*Eutyrrhinus meditabundus* (Curculionidae).
Krüger 3.
*Halticella sp.?* (Halticidae).
Zehntner 27.
*Haplosonyx,* vide Aplosonyx.
* *Haptoncus mundus* and *tetragonus* (Nitidulidae).
Eckart 1; Perkins 1, 9.

*Heteronychus morator* (Lamellicornia).
Deventer 4; Köningsberger 1; Krüger 3; Mulder 1; Zehntner 13, 17.
*Hippodamia convergens* (Coccinellidae).
Koebele 4.
*Hexagonia kirbyi* (Carabidae).
Köningsberger 1.
*H. lucasseni.*
Köningsberger 1.
*Hispa sp.?* (Chrysomelidae).
Deventer 4.
*Hispella wakkeri* (Chrysomelidae).
Deventer 4; Köningsberger 1; Krüger 3; Zehntner 4, 13.
*H. sp.?*
Deventer.
*Holaniaria picescens* (Tenebrionidae).
Deventer 3, 4; Köningsberger 1; Krüger 3.
*Holotrichia leucophtalma* (Lamellicornia).
Deventer 4.
* *Homalota sp.* (Carabidae).
Perkins 1.
*Hoplosternus sp.?* (Lamellicornia).
Köningsberger 1; Krüger 3; Roth 1.
*Hypomeces unicolor* (Curculionidae).
Deventer 4; Krüger 3; Zehntner 13.
* *Hypothenemus sp.* (Scolytidae).
Eckart 1; Perkins 8.
*H. eruditus.*
Blandford 1.
* *Itodacnus sp.* (Elateridae).
Perkins 1.
*Laemotmetus ferrugineus* (Cucujidae).
Stebbing 2.
*Lepidiota albohirta* (Scarabaidae).
Krüger 3.
*L. squamulata.*
Shelton 1; Tryon 2.

*Leptispa pygmaea* (Chrysomelidae).
Stebbing.

*Ligyrus rugiceps* (Lamellicornia).
Comstock 1; Howard 1; Kent 1; Krüger 3; Nicéville 2; Stubbs 1; Titus 1; Tryon 1.

*L. tumulosus.*
Ballou 1; Watson 1.

*Megilla maculata* (Coccinellidae).
Koebele 4.

*M. vittigera.*
Koebele 4.

*Myllocerus isabellinus* (Curculionidae).
Krüger 3.

*Myochrous armatus* (Chrysomelidae).
Theobald 1.

* *Neda abdominalis* (Coccinellidae).
Perkins 1.

*Opatrum acutangulum* (Tenebrionidae).
Deventer 4.

*O. depressum.*
Deventer 4.

* *Orcus ovalis* (Coccinellidae).
Perkins 4.

*Oryctes rhinoceros* (Lamellicornia).
Deventer 4; Muir 3; Zehntner 13.

* *Philonthus sp.* (Staphylinidae).
Perkins 1.

* *Platyomus lividigaster* (Coccinellidae).
Perkins 1.

* *Prosopus banksii* (Cerambycidae).
Terry 6.

*Rhynchophorus ferrugineus* (Curculionidae).
Krüger 3.

*R. sp?*
D'Urban 1.

*R. palmarum*
Avequin 1; Guilding 1; Kirby and Spence 1; Krüger 3; Ormerod 2, 3; Westwood 3.

*Scymnus spp.* (Coccinellidae).
Koebele 4.
* *S. vividus.*
Perkins 1; Swezey 4; Terry 6.
* *S. debilis.*
Kirkaldy 15.
*Sitophilus oryzae* (Curculionidae).
Stebbing 2.
* *Sphenophorus obscurus* (Curculionidae).
Eckart 1; Howard 4; Koebele 2, 3; Muir 3, 4; Perkins 9; Riley and Howard 1, 5; Smith 1; Terry 3, 4; Tryon 1, 3; Whitney 1.
*S. ferrugineus.*
Muir 3.
*S. sacchari,* vide sericeus.
*S. sericeus.*
Avequin 1; Ballou 1; Guilding 1; Kirby and Spence 1; Krüger 3; Lefroy 3, 4; Ormerod 2, 3; Watson 1; Westwood 3.
*Synonycha grandis* (Coccinellidae).
Deventer 4.
*Tomarus bituberculatus* (Cryptophagidae).
Ormerod 3.
* *Verania frenata* (Coccinellidae).
Swezey 1.
* *V. furcifera* [= sp.].
Swezey 1.
*V. lineola,* vide strigula.
* *V. strigula.*
Swezey 1.
*Xyleborus affinis* (Scolytidae).
Blandford 2.
*X. perforans.*
Ballou 1; Blandford 1; Cotes 2, 6; Deventer 4; Riley and Howard 3, 6; Köningsberger 1; Krüger 3; Urich 1; Zehntner 13, 18, 25.
*X. piceus,* vide pubescens.
*X. pubescens.*
Riley and Howard 2, 4.

*X. sp.?*
Stebbing 1.
*Xylotrupes gideon* (Lamellicornia).
Deventer 4; Krüger 3; Muir 3.

## ORDER LEPIDOPTERA.

*Acantholipes pansalis* (Noctuidae). [also Dragana].
Cotes 1, 2; Stebbing.
*Achaea melicerte* (Noctuidae). [also Ophiusa].
Cotes 2; Stebbing.
*Acidalia sp.* (Geometridae).
Deventer 4.
*Agrotis interjectionis*, vide Euxoa.
*A. sp.?* (Noctuidae).
Koebele 4.
*A. dislocata*, vide Feltia.
* *A. crinigera.*
Swezey 6.
*A. saucia*, vide Lycophotia.
* *A. ypsilon.*
Swezey 6.
*Anerastia ablutella* (Pyralidae).
Lefroy 7.
*Anticyra*, vide Dinara.
*Aroa socrus* (Bombycidae).
Deventer 4.
*Automeris sp.* (Saturniidae).
Koebele 4.
* *Anstosticha pelodes* (Gelechiidae).
Swezey 8, 9.
* *Batrachetra rileyi* (Elachistidae).
Swezey 8, 9.
*Borer saccharellus*, vide Diatraea saccharalis.
*Borers* (General).
Zehntner 12; Kobus 4.
*Botys coclesalis*, vide Pyrausta.
*Castnia licus* (Castniidae).
Ballou 1; Marchal 2; Marlatt 1; Urich 2.

*Chilo auricilia* (Pyralidae).
Lefroy 7.
*C. infuscatellus.*
Deventer 4; Köningsberger 1; Krüger 1, 3; Tryon 1; Zehntner 13.
*C. simplex* [also as *saccharalis*].
Alcock 1; Cotes 1, 2, 3, 4; Guenée 1; Krüger 1; Lefroy 6, 7; Nicéville 1, 2; Peal 1; Stebbing 1.
*Chilo,* see also Diatraea.
* *Cirphis unipuncta* [= *saccharivora*] (Noctuidae).
Butler 1; Cook 1; Deventer 4; Köningsberger 1; Krüger 3; Swezey 6.
*C. loreyi.*
Deventer 4; Köningsberger 1; Krüger 3; Zehntner 13.
*Cnaphalocrocis bifurcalis* (Pyralidae).
Deventer 4; Köningsberger 1; Krüger 3; Zehntner 13.
*C. medinalis* [= *jolinalis*].
Deventer 4; Krüger 3.
*Cosmopteryx pallifasciella* (Elachistidae).
Deventer 4; Köningsberger 1; Krüger 3; Zehntner 4, 13, 20.
*Creatonotus gangis* [*Phissama*] (Bombycidae).
Deventer 4; Köningsberger 1; Krüger 3.
* *Cryptoblabes aliena* (Phycitidae).
Swezey 8, 9.
*Cyllo leda* (Rhopalocera).
Deventer 4; Kobus 6; Köningsberger 1; Krüger 3; Zehntner 13.
* *"Dancing Moth"* (Tineidae).
Swezey 8, 9.
*Deiopeia,* vide Utetheisa.
*Diatraea saccharalis* ‡ (Pyralidae).
Avequin 1; Ballou 1; Beckford 1; Bojer 1; Bordage 1; Buick 1; Cockerell 1; Comstock 1, 2; Cook 1; D'Urban 1; Fabricius 1; Guilding 1; Hamilton 1; Hein 1; Howard 2; Hughes 1; Kirby and Spence 1; Koebele 4; Lefroy 1, 2, 3; Mackenzie 1; Morgan 1;

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‡ = *Phalaena saccharalis* = *Chilo saccharalis* = *Proceras sacchariphagus* and *saccharifagus* = *Borer saccharellus.*

Morton 1; Ormerod 1, 2, 3; Porter 1; Riley 1; Riley and Howard 6; Stubbs 1; Stubbs and Morgan 1; Thompson 1; Westwood 4, 5.

*D. striatalis.*
Deventer 4; Hadi 1; Kobus 1; Kolk 1; Köningsberger 1; Krüger 2, 3; Roth 1; Snellen 2; Tryon 1; Yamasaki 1; Zehntner 3, 13, 31.

*Dinara combusta* [*Anticyra* and *Phalera*] (Bombycidae).
Deventer 4; Kobus 6; Köningsberger 1; Krüger 3.

*Discophora celinde* (Rhopalocera).
Deventer 4; Köningsberger 1; Krüger 3; Zehntner 3, 13.

*Dragana pansalis* vide Acantholipes.

*Dreata petola* (Bombycidae).
Deventer 4; Köningsberger 1; Krüger 3.

*Ephestia cautella* (Phycitidae).
Köningsberger 1; Zehntner 27.

*Erechthias sp.* (Erechthiadidae).
Krüger 3; Zehntner 13.

* *Ereunetis flavistriata* (Tineidae).
Swezey 8, 9.

* *E. minuscula.*
Swezey 8, 9.

*E. pilosata.*
Swezey 9.

*E. muiriella.*
Swezey 9.

*Euproctis flavata* (Bombycidae).
Deventer 4.

*E. minor.*
Deventer 4; Köningsberger 1; Krüger 3.

*Euxoa interjectionis* [*Agrotis*] (Noctuidae).
Deventer 4.

* *Feltia dislocata* (*Agrotis*) (Noctuidae).
Swezey 9.

*Grapholitha schistaceana* (Tortricidae).
Deventer 4; Köningsberger 1; Krüger 1, 3; Tryon 1; Zehntner 13.

*Halisidota sp.* (Bombycidae).
Koebele 4.

*Hesperia conjuncta* (Hesperiidae).
Deventer 1, 4; Köningsberger 1; Krüger 3.

*H. mathias.*
Deventer 1, 4; Köningsberger 1; Krüger 3.

*H. philino.*
Deventer 1, 4; Kröningsberger 1; Krüger 3.

*Heliophila unipuncta,* vide Cirphis.

*Laelia subrufa* (Bombycidae).
Deventer 4; Köningsberger 1; Krüger 3.

*L. adara* [*Procodeca*].
Deventer 4; Köningsberger 1; Krüger 3.

*Laphygma frugiperda* (Noctuidae).
Krüger 3; Stubbs 1.

*Leucania loreyi,* vide Cirphis.

*L. saccharivora,* vide Cirphis unipuncta.

*Leucophlebia lineata* (Sphingidae).
Deventer 4; Köningsberger 1; Krüger 3.

* *Lycophotia saucia* (*Agrotis*) (Noctuidae).
Swezey 6.

*Mancipium nepalensis* (Rhopalocera).
Cotes 2; Stebbing 1.

*Mycalesis mineus* (Rhopalocera).
Deventer 4; Köningsberger 1; Krüger 3; Zehntner 13.

"*Noctua gossypii*" (Noctuidae).
Fabricius 1.

*Nonagria exitiosa* (Noctuidae).
Krüger 3.

*N. inferens.*
Nicéville 2.

*N. uniformis.*
Lefroy 7.

* *Omiodes accepta* (Pyralidae).
Eckart 1; Koebele 3; Perkins 9; Swezey 3.

* *O. continuatalis.*
Swezey 3.

* *O. epicentra.*
Eckart 1; Perkins 9.

*Ophiusa melicerta* vide Achaea.

* *Opogona aurisquamosa* (Tineidae).
Swezey 8, 9; Walsingham 1.

* *O. apicalis.*
Swezey 8, 9.

*O. dimidiatella.*
Köningsberger 1; Krüger 3; Zehntner 13.

*O. fumiceps.*
Swezey 9.

*O. subcervinella.*
Walsingham 1.

*O. saccharella.*
Swezey 8, 9.

*Pamphila augias* (Hesperiidae).
Deventer 1, 4; Köningsberger 1; Krüger 3; Zehntner 13.

*P. dara.*
Deventer 4; Krüger 3.

*Phalaena saccharalis,* vide Diatraea.

*Phalera combusta,* vide Dinara.

*Phissama interrupta,* vide Creatonotus gangis.

*Polyocha saccharella* (Pyralidae).
Lefroy 7.

*Proceras sacchariphagus,* vide Diatraea saccharalis.

*Procodera adara,* vide Laelia.

*Psalis securis* (Bombycidae).
Deventer 4; Kobus 6; Köningsberger 1; Krüger 3.

*Pyrausta coclesalis* [*Botys*] (Pyralidae).
Deventer 4; Köningsberger 1; Krüger 3; Zehntner 13.

*Remigia frugalis* (Noctuidae).
Deventer 4; Köningsberger 1; Krüger 3.

*Scirpophaga auriflua* [= *intacta*] (Pyralidae).
Alcock 1; Lefroy 7; Nicéville 2; Peal 1; Stebbing 1; Deventer 4; Krüger 1, 3; Tryon 1; Zehntner 13.

*S. chrysorrhoa.*
Krüger 3.

*S. excerptalis.*
Alcock 1; Peal 1; Stebbing 1.

*S. monostigma.*
Krüger 3.

*Sesamia nonagriodes* (Noctuidae).
Bordage 1, 2; Deventer 4; Howard 7; Krüger 2; Zehntner 19.
*S. albiciliata* vide nonagrioides.
*Sphinx labruscae* (Sphingidae).
Deventer 4; Krüger 3; Guilding 1.
* *Spodoptera mauritia* (Noctuidae).
Deventer 4; Eckart 1; Perkins 9; Swezey 2, 6.
*S. pecten.*
Deventer 4.
*"Tortrix saccharifaga"* (Torticidae).
Delteil 1.
*Utetheisa pulchella* (*Deiopeia*) (Bombycidae).
Köningsberger 1.

N. B. The contents of two apparently important papers are unknown to me, viz., Ragonot 1; Snellen 1.

## ORDER HYMENOPTERA.

*Parasites* (general).
Ballou 1; Kobus 2; Espeut 1, 2; Köningsberger 1.
*Ants* (general).
Barry 1, 2.
*Ablerus pulchriceps* (Chalcidoideae).
Zehntner 23.
* *Ageniaspis sp.* (Chalcidoideae).
Swezey 3.
* *Alaptus immaturus* (Mymaridae).
Perkins 3 (pt. 6).
* *Anagrus frequens* (Myrmaridae).
Perkins 3 (pt. 6); Muir.
*Anomalon sp.* (Ichneumonidae).
Deventer 4.
*Apanteles scirpophagae* (Braconidae).
Nicéville 2.
*Aphelinus mali* (Chalcidoideae).
Zehntner 30.
*A. simplex.*
Zehntner 8.

*Bracon nigrosignatus* (Braconidae).
Deventer 4.
* *Cardiocondyla wroughtonii* (Formicidae).
Perkins 1.
* *Centistes americana* (Braconidae).
Perkins 1; Swezey 1.
*Cephalotes cephalotes* (Formicidae).
Schomburgk 1.
*Ceraphron beneficiens* (Proctotrypidae).
Deventer 4; Zehntner 3.
* *C. abnormis.*
Swezey 7.
*Chaetosticha nana* (Chalcidoideae).
Deventer 4; Krüger 3; Zehntner 3.
*Chalcis carbonaria* (Chalcidoideae).
Deventer 4.
*C. sp?*
Zehntner 20.
* *C. obscurata* [*obsurata!*]
Swezey 3.
* *Chelonus blackburni* (Braconidae).
Swezey 3.
*Closterocerus tricinctus* (Chalcidoideae).
Deventer 4; Zehntner 16, 20.
*Cotesia flaviceps.*
Cotes 3, 4.
* *Cryptid sp.* (Ichneumonidae).
Perkins 1.
*Derostenus albipes* (Chalcidoideae).
Deventer 4; Zehntner 20.
*Dielis formosus* [= *septemcinctus*].
Froggatt 1; Tryon 4.
*Dorylus orientalis.*
Alcock 1; Peal 1; Stebbing 1.
* *Echthromorpha maculipennis* (Ichneumonidae).
Swezey 3.
* *Ecthrodelphax fairchildii* (Dryinidae).
Perkins 1.

*Elasmus sp.* (Chalcidoideae).
Zehntner 26.
*Encarsia flavoscutellum* (Chalcidoideae).
Deventer 4; Zehntner 27.
*Eulophus femoralis* (Chalcidoideae).
Deventer 4; Zehntner 4.
* *Eurytoma sp.* (Chalcidoideae).
Swezey 3.
*Formica analis* vide Megaponera foetens.
*F. cephalotes,* vide Cephalotes.
*F. rufonigra,* vide Sima.
*F. omnivora,* vide Monomorium. *
*F. saccharivora,* vide Lasius.
*F. vinsonnella.*
Dufour 1.
* *Gonatocerus cingulatus* (Mymaridae).
Perkins 3 (pt. 6).
* *Gonatopus* (Dryinidae).
Perkins 3 (pt. 6).
*Goniozus indicus* (Dryinidae).
Nicéville 2.
* *Haplogonatopus vitiensis* (Dryinidae).
Swezey 7.
* *Hemiteles* (Braconidae).
Kirkaldy 10, Perkins 1.
* *Ichneumon koebelei* (Ichneumonidae).
Swezey 6.
*Labolips* (Proctotrypidae).
Zehntner 23.
*Lasius saccharivorus* (Formicidae).
Castles 1; Kirby and Spence 1; Schomburgk 1.
* *Leptogenys falcigera* var. *insularis.*
Swezey (not recorded).
* *Limnerium blackburni* (Braconidae).
Swezey 3.
*Macrocentrus sp.*
Deventer 4; Zehntner 26.

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* *Eciton omnivorum* (which ought to be called *E. coecum*) is quite a different form.

*M. nicevillei.*
Nicéville 2.
* *Macrodyctium omiodivorum* (Braconidae).
Swezey 3.
*Megaponera foetens* [*analis*] (Formicidae).
Kirby and Spence 1.
* *Melittobia hawaiiensis* (Chalcidoideae).
Swezey 8, 9.
* *Microdus hawaiicola* (Braconidae).
Swezey 8, 9.
*Microgaster sp.* (Braconidae).
Deventer 4.
* *Monomorium floricola* (Formicidae).
Perkins 1.
*M. omnivorum.*
Krüger 3; Schomburgk 1.
* *Odynerus nigripennis* (Vespidae).
Swezey 3.
* *O. spp.*
Swezey 8, 9.
*Ooctonus australensis* (Mymaridae).
Perkins 3 (pt. 6).
* *Ootetrastichus beatus* (Chalcidoideae).
Muir.
*Ophion antankarus* (Ichneumonidae).
Bordage 1; Howard 7.
*O. mauritii.*
Bordage 1; Howard 7.
* *Paranagrus optabilis* (Mymaridae).
Muir; Perkins 3 (pt. 6).
* *Paraphelinus xiphidii* (Chalcidoideae).
Perkins 3 (pt. 8).
* *Pheidole megacephala* (Formicidae).
Perkins 1; Swezey 8, 9.
*Physcus flavidus* (Chalcidoideae).
Zehntner 21.
* *Pimpla hawaiiensis* (Ichneumonidae).
Swezey 3.

* *Pison sp.* (Crabronidae).
Kirkaldy 10.
*Pleurotropis thoracica* (Chalcidoideae).
Zehntner 20.
* *Polistes aurifer* (Vespidae).
Swezey 3, 4.
* *P. hebraeus.*
Swezey 3.
* *P. macaensis.*
Swezey 3.
* *Polynema reduvioli* (Mymaridae).
Perkins 3 (pt. 6).
* *Prenolepis bourbonica* (Formicidae).
Perkins 1.
*Prospalta tristis* (Chalcidoideae).
Krüger 3; Zehntner 7.
* *Pseudogonatopus saccharetorum* (Dryinidae).
Perkins 3 (pt. 7).
* *Sceliphron caementarium* (Vespidae).
Kirkaldy 10.
* *Sierola dichroma* (Bethylidae).
Swezey 3.
* *S. molokaiensis.*
Swezey 8, 9.
*Sima rufonigra* (Formicidae).
Roth 1.
* *Tapinoma melanocephala* (Formicidae).
Perkins 1.
* *Tetramorium guineense* (Formicidae)
Perkins 1.
*Tetrastichus sp.* (Chalcidoideae).
Zehntner 27.
* *Trichogramma pretiosa* (Chalcidoideae).
Koebele 4; Swezey 3.

## ORDER DIPTERA.

* *Chaetogaedia monticola* (Tachinidae).
Swezey 3, 6.
*Chaetopsis aenea* (Ortalidae).
Howard 5.
*Diplosis acarivora* (Cecidomyiidae).
Deventer 4.
* *Drosophila sp.* (Drosophilidae).
Perkins 1.
* *Eristalis punctulatus* (Syrphidae).
Perkins 1.
* *Euxesta annonae* (Ortalidae).
Eckart 1, Perkins 1, 9.
* *Frontina archippivora* (Tachinidae).
Swezey 3, 6.
* *Leucopis sp.* (Agromyzidae).
Kirkaldy 10.
*Masicera sp.?* (Tachinidae).
Deventer 4.
*Phytomza sp.* (Phytomyzidae).
Deventer 4; Krüger 3; Köningsberger 1; Zehtner 4, 13.
* *Pipunculus juvator* (Pipunculidae).
Perkins 1; Swezey 4.
* *P. terryi.*
Perkins.
* *Sarcophaga sp.* (Sarcophagidae).
Perkins 1.
*Syrphid sp.* (Syrphidae).
Deventer 4; Zehntner 30.
*Tachina sp.* (Tachinidae).
Koebele 4.
*Tipula sp.* (Tipulidae).
Deventer 4; Köningsberger 1; Krüger 3; Zehntner 13.
* *Volucella obesa* (Syrphidae).
Perkins 1.
* *Xanthogramma grandicornis* (Syrphidae).
Swezey 4.

## CLASS ARACHNIDA.

*Acari* (unnamed).
Boger 1; Bancroft 3; Hooker 1; Michael 2; Roth 1, 2.

*"Acarus sacchari."*
Nicol 1; Cameron 1.

* *Argyope avara* (Araneidae).
Kirkaldy 10; Perkins 1.

* *Argyrodes argyrodes* (Theridiidae).
Kirkaldy 10.

* *Artema sisyphoides* (Pholcidae).
Kirkaldy 10.

* *Baria aericeps* (Salticidae).
Kirkaldy 10.

* *Cyclosa sp.* (Araneidae).
Perkins 1.

* *Dysdera crocata* (Dysderidae).
Kirkaldy 10.

* *Erigone vagans* (Araneidae).
Kirkaldy 10.

* *Hasarius adansoni* (Salticidae).
Kirkaldy 10.

* *Heteropoda regia* (Clubionidae).
Kirkaldy 10.

*Histiosoma rostroserrata* (Acarina).
Michael 1.

* *Lycosa sp.* (Lycosidae).
Kirkaldy 10.

* *Mollica microphthalma* (Salticidae).
Kirkaldy 10.

* *Pagiopalus atomarius* (Misumenidae).
Kirkaldy 10; Perkins.

*Phytoptus sp.* (Acarina).
Zehntner 13.

* *Plexippus paykulli* (Salticidae).
Kirkaldy 10.

* *Proernus schauinslandi* (Misumenidae).
Kirkaldy 10.

* *Scytodes marmorata* (Sicariidae).
Kirkaldy 10.
* *Smeringopus elongatus* (Pholcidae).
Kirkaldy 10.
*Tarsonymus bancrofti* (Acarina).
Bancroft 1; Deventer 4; Krüger 3; Michael 1; Zehntner 13.
* *Tetragnatha mandibulata* (Araneidae).
Kirkaldy 10; Perkins 1.
*Tetranychus exsiccator* (Acarina).
Deventer 4; Krüger 3; Zehntner 13, 28.
* *Theridion tepidariorum* (Theridiidae).
Kirkaldy 10.
*Tyroglyphus longior* (Acarina).
Roth 1; Fumouze 1.

## CLASS MYRIAPODA.

*Scolopendra subspinipes.*
(Not recorded).

## CLASS CRUSTACEA.

*Paratelphusa maculata* (Decapoda).
Deventer 4; Krüger 3; Zehntner 13.

## PARASITES, OR ARTIFICIAL CONTROL

(Not classified above.)

Compere 1.
Craw 1, 6.
Espeut 1.
Froggatt 2, 3.
Howard 8.
Kirkaldy 13, 16.
Koebele 1.
Marchal 1.
Mead 5.
Silvestri 1.

The following references have not been classified above, for various reasons, either because they are too general in character, because I have not seen them, or for other reasons.

Fleutiaux 1.
Horner 1.
Johnstone 2.
Kotinsky 1.
Mead 1, 4.
Newlands 1.
Olliff 1.
Perkins 6, 8.
Ridley 1.
Terry 1, 5.
Turnbull 1.
Turner 1.
Whitney 2, 3.

## SUMMARY OF GENERA AND SPECIES.

| Order | Genera | Species |
|---|---|---|
| Neuroptera | 4 | 7 |
| Orthoptera | 24 | 35 |
| Thysanoptera | 7 | 10 |
| Hemiptera | 57 | 81 |
| Coleoptera | 65 | 89 |
| Lepidoptera | 50 | 81 |
| Hymenoptera | 67 | 79 |
| Diptera | 15 | 18 |
| Insecta | 289 | 400 |
| Arachnida | 24 | 24 |
| Crustacea | 1 | 1 |
| Myriapoda | 1 | 1 |
| | 315 | 426 |

These figures are not exact, as several of the species are not positively determined.

N. B.—Throughout for "Köningsberger," read "Koningsberger."

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ENTOMOLOGICAL SERIES

BULLETIN No. 10

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

# Parasites of Insects Attacking Sugar Cane

By R. C. L. PERKINS

HONOLULU, HAWAII
1912

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By R. C. L. PERKINS

HONOLULU, HAWAII
1912

# LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the Hawaiian Sugar Planters' Association,
Honolulu, Hawaii.

Dear Sirs:

I herewith submit for publication as Bulletin No. 10, of the Entomological Series, an article by Dr. R. C. L. Perkins, Enomologist, entitled: "Parasites of Insects Attacking Sugar Cane."

Yours very truly,

C. F. ECKART,
*Director.*

Honolulu, February 26, 1912.

# Parasites of Insects Attacking Sugar Cane.

By R. C. L. PERKINS.

In this Bulletin is described a number of very minute parasites, nearly all of which were bred from eggs of insects attacking cane in countries other than these islands.

The American species were obtained by Mr. Koebele, when investigating insects in the cane fields in Mexico, where he spent a short time during the winter months of 1908. All the rest were obtained by Mr. Muir in Fiji, China and the Malay islands. Many of these parasites are of great interest and importance, since they are important agents in limiting the numbers of injurious species, which, if introduced into the islands without their parasites, would be likely to cause great loss to the sugar plantations. It has been advisable, therefore, to work out these insects and put them on record, so that in the event of any of the species which they attack turning up in the islands, information would be at hand as to where to look for natural enemies without delay. Although there is now a regular inspection of all imported plants and, without doubt, the vast majority of injurious insects is intercepted and destroyed, yet there are means of introduction which no inspection can provide against. Also there are some insects which are liable to be passed over by the most shrewd inspector and against which treatment by fumigation is ineffective. We know that in spite of the fact that there has been a systematic inspection of introduced plants for nine years, during the last few years numerous new insects have appeared and become abundant. Because this is the case there is no reason to regard inspection as futile, for as has been said, there is no doubt that the majority of imported species is thereby prevented from becoming established. With the opening of the Panama Canal and with quick steamers from Central America we may safely predict that an entirely new lot of insects will be brought here, and that the duties of inspectors will become still more onerous. Many of these insects will be particularly dangerous, because we know that species from the warmer parts of the American continent readily become established and thrive here, whereas the native insects of California though they have often been brought here, generally fail to establish themselves. This climate is evidently not suited to them. Although cane is no longer imported into the islands, yet many bad cane pests are by no means restricted to cane, but may easily be brought with other plants. It is well known that steamers have put in here from Fiji carrying cane on board, from which insects might easily have escaped to the shore, although such cane is not landed. It is also known that both on cane and on other plants, carried on deck, insect pests are frequently numerous. Mr. Muir has observed this to be the case with sugar cane carried on deck from Fiji, and Mr. Koebele and myself noticed great quantities of fruit fly maggots dropping from fruit carried on the deck of steamers, when we were traveling along the Australian coast. These fruit-fly maggots were crawling into cracks of the deck and pupating there and some would certainly be likely to hatch out and gain the shore at other ports. Quick travelling steamers may carry even mature insects an enormous distance, so that they reach new countries by flight, when in or near port. Mosquitoes were still seen on board the ship on my last journey to San Francisco, five days after leaving Honolulu. On another journey numbers of a Chinese moth were seen about the decks the whole way to San Francisco. It would be very difficult and probably impracticable to keep such things from becoming established in a country suitable to them.

## CHALCIDOIDEA

### EULOPHIDAE

The species of this family here described belong to two subfamilies, the Eulophinae and Tetrastichinae. Only one species *Closterocerus javanus* belongs to the former, and I suspect that it is hyperparastic, attacking one or more species of the egg-parasites of Delphacid leaf-hoppers, these parasites belonging to the genus *Ootetrastichus*. The Tetrastichinae are chiefly represented by the latter genus, of which seven new species are here described. The members of this subfamily were supposed by the late Dr. Ashmead to be hyperparasites, but it is now known that many are primary parasites. They are of great importance in the Oriental region in limiting the number of various species of sugar-cane leaf-hoppers. Another Tetrastichine, *Neotetrastichus mimus* I cannot fit into any hitherto described genus. It is superficially extremely similar to some of the species of *Ootetrastichus,* but it has very different antennae.

## *Ootetrastichus.*

Ootetrastichus Perkins, Bull. Exp. Station Hawaii, I, 263.

This genus was founded for the single species O. *beatus* Perk., of which only the female was known. It is remarkable in this sex for the 7-jointed antennae, which possess in addition apparently three ring-joints, or even sometimes have the appearance of bearing four such joints.

Although O. *beatus* has now been under observation for seven or eight years and has been bred generation after generation for long periods of time, no male has ever been seen, either in these islands, where it is fully established and now very common, or elsewhere.

On the other hand the males of four other species, described below are now known. In general structure they are like the females, but even in life their sex would be easily recognized by the enormously dilated scape of the antennae. These organs are unlike those of the female, having two additional joints, the complex nature of the ring joints being the same in each sex. The scape of the male is ovate, long and large; there are four elongate funicle joints, not usually differing very much in length, and a distinctly three-jointed club. In one species (*O. holochlorus*) the marginal vein is notably thickened and in some males there is a sexual modification of the apical joint of the front tarsi.

## SYNOPSIS OF SPECIES

1. Antennae with 9 joints in addition to ring-joints (males) .......................................... 10
   Antennae with 7 joints in addition to ring-joints (females) .......................................... 2
2. Hind coxae pale, not metallic ........................ 3
   Hind coxae dark, metallic .......................... 5
3. Mesonotum with conspicuous dark area in front, this area metallic in dry examples ..............*O. beatus*
   Mesonotum without metallic dark area in front.

4. Lateral spots of abdomen distinct, propodeum with some infuscation ........................... *O. tarsalis*
   Lateral spots of abdomen absent or inconspicuous, propodeum entirely pallid ............... *O. holochlorus*
5. Thorax and abdomen not wholly dark ............... 6
   Thorax and abdomen wholly dark .......... *O. metallicus*
6. Thorax wholly metallic ........................... 7
   Thorax largely pale, the propodeum mostly dark and metallic, mesonotum with dark spots, etc. .... *O. muiri*
7. Basal half (or nearly) of abdomen pale (whitish or pale yellow) ...................................... 8
   Basal part of abdomen somewhat paler than the apical, but the paler part with darker lateral markings..... .................................. *O. pallidipes*
8. First funicle joint extremely long, three times as long as wide where widest ..................... *O basalis*
   First funicle joint much shorter, at the most rather more than twice as long as wide ..................... 9
9. First funicle joint longer than the second, *O. homochromus*
   First funicle joint subequal to the second, *O. distinguendus*
10. Hind coxae pale ...............................11
    Hind coxae dark ...............................12
11. First funicle joint subequal to the second... *O. holochlorus*
    First funicle joint much longer than the second, *O tarsalis*
12. Whole thorax dark and metallic .............. *O. basalis*
    Thorax pale with dark markings or at least with the mesonotum on its posterior half pallid ............13
13. Mesonotum dark only near its front margin; scutellum pale, at most slightly infuscate and not metallic, abdomen not wholly dark on the apical segments, *O muiri*
    Mesonotum dark on fully its anterior half, scutellum notably darkened and metallic, apical part of abdomen wholly dark and metallic .............. *O. pallidipes*

### (1) *Ootetrastichus holochlorus* sp. nov.

Entirely pallid, yellowish, very probably green in life, the head in dead examples generally darker than the thorax. The thorax bears a few extremely small dark spots or infuscations; one at the hind angles of the pronotum and another close to the tegulae are probably always present, black or nearly so. Legs entirely pallid, except the extreme tips of the tarsi; apex of the sheath of the ovipositor also dark. Neuration pale.

Antennae of the female with seven distinct joints, scape, pedicel, three-jointed funicle and two-jointed club. Between the pedicel and funicle there is an appearance of three ring-joints as in *O. beatus*, the type, and in other species of the genus. First funicle joint less elongate than is usual in the genus, only about one and a quarter or one and a third times the length of the second; club rather longer than two preceding joints together and slightly shorter than the first and second funicle joints together.

Male with the scape greatly dilated, with rounded sides, ring joints as in the female or even apparently four transverse divisions visible; first funicle joint elongate, twice as long as wide, but slightly shorter than the second, the four funicle joints not differing much in length. The club is distinctly three-jointed and is much longer than the two preceding joints together, but not so long as the three preceding. The male therefore has one distinct club-joint and one distinct funicle joint more than the female, and apart from the antennal characters differs from the latter in having the marginal vein of the front wings much thickened or wider. The apical joint of the front tarsi is also widened and black. Length .66—1.2 mm.

Hab. Java, Pekalongan, No. 280 (Muir). From eggs of Delphacid on sugar-cane, either *Perkinsiella saccharicida* or *vastatrix*.

### (2) *Ootetrastichus tarsalis* sp. nov.

Pallid, flavescent, generally similar to *O. beatus* and *O. holochlorus*, the pattern of markings in most respects like these.

Head pale, each ocellus more or less enclosed in a dark ring. Posterior angles of pronotum, the parapsides and axillae anteriorly, two spots at the base of the tegulae, an area on each side of the middle line of the propodeum, black or fuscous. Abdomen with five distinct lateral spots on each side, a pair to each segment, the basal pair sometimes less evident. In the male the fifth pair of spots are notably enlarged and tend to form a fascia. The spot at the front of the parapsides is sometimes faint or absent. No dark and metallic area on the mesonotum in front. All the coxae pale. Antennae of female with first funicle joint very long, about four times as long as wide, second much shorter, about two-thirds as long as the first, and subequal to the third. Antenna of male with the usual sexual differences, the scape greatly dilated, the first funicle joint much longer than is usual in this sex, very similar to that of the female, being slender and elongate, and very much longer than the second, the latter and the two following not differing much in length, but the second is much slenderer, the third and fourth being subelliptic.

Fourth joint of front tarsi in the male much widened, black and clothed with black hairs. Length .8—1.25 mm.

This is a very distinct species, the female being distinguished from that of *O. beatus* by the absence of the dark metallic areas on the front part of the mesonotum. The male differs greatly from *O. holochlorus* and other species, in the long first funicle joint of the antennae and has the apical joint of the front tarsi more highly modified.

Hab. Amboina (No. 445); host as in the preceding.

### (3) *Ootetrastichus muiri* sp. nov.

Yellow (or probably greenish in life) becoming more sordid after being mounted in balsam, and the head more reddish. Conspicuous black thoracic marks are placed at the front of the mesonotum, the hind angles of the pronotum, the anterior angles of the parapsides, on the axillae, and between these and the tegulae, as in *O. beatus*. There are also lateral abdominal spots as in that species.

The metathorax (post-scutellum) and most of the propodeum, including the middle and sides, are dark, as also are the hind coxae and a large part of the mesopleura. All the dark markings are of a metallic green color in certain lights. The color of the male is in general like that of the female, but the black markings near the apex of the abdomen are more developed and appear to form a dark band. Antenna of the female nearly similar to that of *O. beatus;* in the male the scape is ovate, enormously dilated, the pedicel about equal to the first or second funicle joints, which are subequal, the first being three times as long as wide or rather more than this. There are four distinct funicle joints and three club joints. There are probably two ring joints, these having the appearance of being three. Length 1.5 mm.

Hab. China, Shek Lung (Muir); eggs of cane Delphacid.

### (4) *Ootetrastichus basalis* sp. nov.

Thorax metallic green, abdomen pale on about the basal half, the apical part being dark and with metallic reflections. Legs and antennae more or less sordid, and the head brown in balsam preparation. Middle and hind coxae black or nearly so, and no doubt metallic. Antennae of female with the first funicle joint very long, about one and a half times the length of the elongate second, and about five times as long as its own width near the apex of the joint, third joint rather more than twice as long as wide; club nearly equal in length to the two preceding joints together. Thorax microscopically longitudinally rugulose; the abdomen elongate, as long or longer than the head and thorax together.

Male with the thorax wholly dark and metallic, the hind coxae conspicuously so, except at the apices, which are pallid. The abdomen is pale yellow or whitish basally, black or dark and metallic on the apical segments. The antennae have nine distinct joints, scape, pedicel, four funicle joints and a three jointed club, in addition to two or three ring joints. The scape is ovate and of enormous size, being greatly dilated, the first and second funicle joints are elongate, slender and subequal, the two following are more robust, especially the fourth. The marginal vein is normal, not noticeably thickened.

I have examined one female and three males of this species. The latter are mostly more or less discolored. They appear to closely resemble the female in color, but the abdomen is perhaps more extensively pallid. Length .8—1.5 mm.

Hab. Java, Pekalongan (Muir); from eggs of cane Delphacid.

### (5) *Ootetrastichus homochromus* sp. nov.

Like *O. basalis* in appearance, the thorax and hind coxae dark and metallic, the base of the abdomen widely, and the legs, including the front and middle coxae, pallid.

This species is easily distinguished from *O. basalis* by the length of the first funicle joint of the antennae, which is distinctly but not greatly longer than the second, and is only about twice as long as its greatest width, subequal to the pedicel or a trifle longer. Length 1.2 mm. The male is not known.

Hab. Amboina (Muir); from eggs of *P. vastatrix.*

### *O. homochromus* var. *dubiosus* nov.

Like the preceding, but with longer first funicle joint, this being distinctly longer than the pedicel, and also distinctly more than twice as wide as long. Male not known.

Hab. Amboina.

### (6) *O. distinguendus* sp. nov.

Like the two preceding in form and color but easily distinguished by the comparatively very short basal funicle joint, the elongation of which is usually so characteristic of the genus. This joint is a little shorter than the pedicel and of the same length, or very nearly so, as the second funicle joint. Male not known. Length 1 mm.

Hab. Amboina.

### (7) *Ootetrastichus pallidipes* sp nov.

The thorax is metallic, the mesonotum in part at least, being paler than the pronotum or the hind part of the thorax, and it has a more golden metallic color. The head is more or less pale, though somewhat infuscate. The mesopleura and mesosternum are dark and metallic, as also the hind coxae, but all the femora, tibiae and tarsi (except the tips) are pale, clear yellow. The abdomen is paler on the basal segments than on the apical ones, but the former have darker lateral infuscations.

The antennae do not present any striking character, the first funicle joint being much longer than the second, the second fully twice as long as its greatest width. The abdomen is long and pointed at the apex, not twice as long as the thorax, but more than one and a half times as long; the ovipositor sheath in the unique example is subexserted and black or nearly so.

The male which I refer to this species differs rather remarkably from the female, in having the hind part of the mesonotum clear yellow and apparently not metallic. The whitish basal portion of the abdomen bears a pair of blackish spots on each side. The antennal characters do not differ much from those of other species, the fourth funicle joint being evidently wider and slightly shorter than the second. The head is yellow, unless discolored. Length 1.5 mm.

Hab. Java, Pekalongan (Muir); bred in company with *O. holochlorus.*

### (8) *Ootetrastichus metallicus* sp. nov.

Female entirely dark, the thorax metallic green, the abdomen dark brown or black, less conspicuously metallic than the thorax and like the head becoming paler in balsam preparations. The legs and antennae are more or less infuscate or smoky.

The pedicel, second and third funicle joints do not differ much in length, the first funicle joint (not counting the ring joints) is very long, about one and a half times the length of the second or third, the club is as long as the two preceding together, its apical joint being much longer than the basal. Thorax with very distinct longitudinal rugulosity, the scutellar grooves very distinct. Abdomen elongate, when fully extended longer than the head and thorax together. Length 1—1.2 mm.

Hab. Java, Pekalongan, No. 280 (Muir); bred in company with *O. holochlorus.*

## *Neotetrastichus* gen. nov.

Head transverse, but rather large, the ocelli in a triangle, the outer ones remote from the eye-margins, each being much more distant from the nearest eye than from anterior ocellus. Antennae nine-jointed with the one ring joint, the scape simple, elongate, with a short basal pedicel, three funicle joints all elongate and subequal, the pedicel also subequal to these, the club elongate, three jointed, subequal to the two preceding joints together, or a little longer than these, the apical joint terminating in a long spine, not much shorter than the rest of the joint. The antennae are clothed, but not densely, with long hairs. Thorax of the usual Tetrastichine structure, the mesonotum without a median groove, the scutellum with two pair of grooved lines. Front wings somewhat densely hairy, blunt and broad at the apex, stigmal vein prolonged apically with three or four circular bubble-like granules; marginal cilia short, the longest not more than one-quarter as long as the greatest width of the wing. Hind wings very acutely pointed at the apex, discal cilia of apical portion very sparse. Abdomen somewhat robust, subequal to the thorax in length; ovipositor sheath stout, not extended behind the dorsum of abdomen. Female.

## *Neotetrastichus mimus* sp. nov.

Thorax entirely dark, no doubt metallic in dry mounts, legs and basal abdominal segments pallid yellow, apical segments dark like the thorax. Antennae infuscate, pedicel more or less pale, head pale more or less reddish, or orange in balsam; hind femora dark at extreme base above.

Three funicle joints subequal, or the first very slightly shorter, second and third about three times as long as the greatest width, first club joint twice as long as wide but much shorter than the preceding funicle joint. Thorax apparently with excessively fine surface sculpture, hardly visible even under high powers. Neuration pale. Abdomen clothed with sparse dark hairs; sheath of ovipositor dark. Female. Length 1.5 mm.

Hab. China, Macao; bred from *Agromyza* mining leaves of *Vigna sinensis*.

### *Closterocerus* Westwood.

I assign to this genus a minute species of brilliant metallic color, which in some respects differs in its characters from those given by Ashmead, who was acquainted with a number of species of the genus. The penultimate and antepenultimate antennal joints are not transverse.

### *Closterocerus javanus* sp. nov.

Metallic blue and green, in balsam becoming piceous, and less brightly metallic. Legs pale yellow (at least in the female) the coxae all dark, the hind femora also conspicuously dark, the tips being pallid. Pedicel of antennae notably dark by reflected light, the following joints paler.

Antennae of female eight-jointed with the ring joint, the latter sometimes hardly distinguishable, except after treatment with potash. The pedicel is large and elongate, longer than the ring-joint and two following joints together; the fourth antennal joint (counting the ring joint) is about as long as wide, and smaller than the next following, the sixth is longer than its greatest width, the seventh still more elongate, while the eighth without including its spinose prolongation is as long as, or longer than the seventh, and with this prolongation not much less than twice as long.

The antenna of the male is almost like that of the female, but the fourth and eighth joints appear rather longer, the latter with its apical prolongation being a little longer than the two preceding together. In both sexes the flagellar joints are clothed with long hairs, longer than the joints bearing them. They also bear sparse short spinose or scale like processes, the longest of which is situated at the base of the spinose prolongation of the apical joint.

Thorax with conspicuous microscopical reticulation, the surface shining. Wings not very densely hairy, the clothing terminating basally in an angle before the base of the marginal vein; longest marginal cilia in length about one-third the greatest width of the wing; submarginal vein shorter than the marginal; stigmal longer than the post marginal, a distinct roundish smoky spot occupying the middle of the wing from costal to dorsal margin and including the stigmal vein; the latter with a prolongation of four round bubble-like granules from its posterior side before the apex; mediodiscal cilia absent from the apical portion of the hind wings. Abdomen of the female elongate-ovate, pointed, rather less than twice the length of the thorax, brilliantly metallic (normally purple) at the base; ovipositor not or hardly exserted. Abdomen of male about equal in length to the thorax. Length .7—1 mm.

Hab. Java, Pekalongan; in company with *Ootetrastichus;* bred from cane.

### TRICHOGRAMMIDAE.

Two of the species of this family here described, were reared from the eggs of Jassidae, attacking sugar-cane in Mexico. One of these I cannot place in any of the numerous genera described by Girault, who has done excellent work on the North American species. This family has been divided into two subfamilies on the character of the hairs on the wing, but it appears to me than this division is unnatural, separating genera that are really allied, and even as a matter of convenience is of little practical use, since it is quite doubtful to which family certain forms should be referred. This is the case with the genus *Jassidophthora* described by me. All the Trichogrammidae known to me have a sessile abdomen, penetrated by the thoracic phragma, and by the longitudinal thoracic muscles. This is also the case with the Aphelininae of the family Eulophidae and with certain of the Mymaridae, but is otherwise rarely seen in the Chalcid series of families. The species of *Pentarthron* here described, destroys the eggs of the very injurious moth-borer, *Diatraea saccharalis.*

### *Westwoodella plebeia* sp. nov.

Yellow, the head dark, sordid brown, meso- and metapleura above the coxae conspicuously dark, like the coxae themselves, trochanters yellow, the femora and tibiae embrowned or darkened, the apical joint of all the tarsi black or blackish. The basal abdominal segment above is more or less dark, as also is the sheath of the ovipositor, and generally more or less of the apex of the abdomen. Pronotum sometimes infuscate. Wings hyaline, the apex of the submarginal vein blackened and with a faint trace of infuscation below on the basal side of this dark line, stigmal vein (except its apical prolongation) mostly infuscate, the infuscation being continued narrowly downwards, the whole forming a curvate dark marking, reaching the middle of the width of the wing. Antennae 7-jointed, with a distinct ring joint; the single funicle joint is elongate, and when seen in its widest aspect is not much less than twice as long as wide, the pedicel is very elongate, being much longer than the ring joint and funicle together, but not twice as long as the funicle joint alone. The club is subequal to the pedicel, ring joint and funicle together, its basal joint at its widest is nearly as wide as long, and is about equal in length to the following joint, the apical joint is pointed and has a spinose apical prolongation on each side; the club is much wider than the funicle joint. The front wings are narrow, about three and a half times as long as their greatest width, the longest cilia about two-thirds as long as this width, the discal ciliation is irregular and not dense, terminating beneath the stigmal vein, basal of which the wing is almost free of hairs. The marginal vein is very long, fully as long as the submarginal, the stigmal is moderately long and is excised at the apex, so as to form two processes, one directed transversely to the wing, the other directed apically. The hind wings are covered with microscopic roundish infuscations of the membrane, rendering them notably darker than the front ones; they bear a single row of upright setae placed well within the costal margin, but much nearer this than the dorsal, in addition to the longer hairs on or close to the costa; the spine bearing the hooks, by which the wings are united for flight, is elongate and very strong. Abdomen stout, not elongate. Length .75 mm.

Hab. Mexico, Orizaba, Vera Cruz, Jan. 4th, 1908; from Jassid eggs on sugar-cane.

## *Jassidophthora* gen. nov.

Head rather large, the lateral ocelli remote from the eye margins. Eyes with very short and sparse microscopic hairs. Antennae of female 9-jointed; scape, pedicel, ring-joint, 3-jointed funicle and 3-jointed club. Scape cylindrical, pedicel large obovate or obconical, nearly twice as long as the ring-joint and funicle together, club as long or longer than the pedicel, ring-joint and funicle together, three-jointed. The first funicle joint might almost equally well be considered as a second ring-joint, but it is very closely associated with the second funicle-joint and generally continues the outline of the latter; third funicle joint smaller than the second, which is the largest, and all are short and transverse. Antennae of male hardly different from those of the female.

Front wings not very wide, more than twice as long as wide, where widest; submarginal vein greatly thickened on less than its apical half, its basal slender portion subequal to the elongate marginal vein, the stigmal vein shortish and robust, with acute projection on the apical side. Discal ciliation consisting of about a score of lines, where the wing is widest, two or three of the lines more or less distinct from the others, especially two near the middle of the wing, one of which originates from the free end of the stigmal vein, the other below this and subparallel to it, but even these lines only stand out clearly defined on their basal part. On the costal half of the wing the cilia are quite irregular. Hind wings with two rows of discal hairs, neither of which is median in position. Abdomen of female acute at apex, elongate, longer than head and thorax together.

### *Jassidophthora prima* sp. nov.

Face and front of head infuscate, the antennae more or less darkened, but the short funicle is quite pale. Pronotum and mesonotum black or nearly (or dark fuscous in balsam) the mesonotum with a yellow median line, united with the yellow hind margin; the axillae are dark, the scutellum, postscutellum and propodeum (except at the sides) yellow. Abdomen more or less sordid yellow or reddish, dark or black at the sides and basally, by transmitted light with an appearance of obscure bands. Color of male very similar, perhaps generally paler. Coxae, basal joint of trochanters and the femora notably dark to a large extent, the tibiae paler, but still somewhat infumate. Wings clear hyaline with a distinct smoky cloud enclosing the stigmal vein, on which it appears darkest, and subinterrupted above the dorsal margin, where it is again quite distinct; the wing basal of this is somewhat irregularly smoky. Longest cilia of front wing about one-third to one-fifth as long as the greatest width of the wing, apparently longer in the male than in the female. Scutellum with a pair of black bristles widely separated and a pair of stronger ones posterior and interior to these, but far in advance of the hind margain. Sculpture extremely fine and indistinct. Length .6—.75 mm.

In life the dark parts of the insect are no doubt black, the pale parts orange or yellow.

Hab. Mexico, Cuantla, Morelos; from Jassid eggs in cane. (Koebele).

### *Pentarthron fasciatum* sp. nov.

Flavescent, more or less orange in balsam, the apical segments and especially those immediately before the apex of the abdomen blackish, so as to form a wide transverse dark band. Wings clear hyaline, but with a large and conspicuous dark basal area, extending across the wing to the tip of the stigmal vein. In general structure, antennae, etc., this species is like *P. flavum* of Hawaii, but the hairy clothing of the wings is somewhat different. It is not yet certain, whether *P. flavum* is identical with *Trichogramma pretiosa.* In *P. flavum* and *fasciatum* alike, there are six hairlines in the field of the wing from the costa to the line which rises at the apex of the stigmal vein, this line being the sixth. In *P. flavum* between the fourth and fifth hair line there are many additional hairs, in *P. fasciatum*, at most five or six and even only two or three. The hairlines between the one proceeding from the apex of the stigmal vein and the dorsal margin are mostly very clear and distinct in *fasciatum*, whereas in *flavum* there are many irregular hairs between some of the lines. *P. fasciatum* has in all about 13 distinct hair lines on the broad part of the wing toward the apex. The hind wings are smoky basally and have a complete row of discal cilia from the stigmal region to the apex, nearer the costal margin than the dorsal, at least on the apical portion of the wing. Length .5 mm.

Hab. Mexico, Orizaba, Vera Cruz, from eggs of *Diatraea saccharalis,* Dec. 11th, 1907 (Koebele).

## MYMARIDAE.

This interesting family, of recent years minutely studied by Girault, has been divided into two subfamilies on the number of joints in the tarsi. I do not attach the same importance to this character as to the condition of the abdomen and thorax and consider that allied form are widely separated by using it. The further subdivisions utilized by Ashmead, whereby the genera with sessile and subsessile abdomen are grouped together is not natural and the subsessile forms should, unless further subdivision is made, be placed with the petiolate ones. If the Mymaridae be treated as a mere family in the Chalcid group, the truly sessile forms make the nearest approach to the Trichogrammidae and Eulophidae (Aphelininae).

I should arrange the groups as follows:

1 (4) Abdomen sessile. with thoracic phragma and muscles continued into the abdomen .............. *Alaptidae*
2 (3) Tarsi five-jointed ......................... *Alaptinae*
3 (2) Tarsi four-jointed ..................... *Anagrinae*
4 (1) Abdomen subpetiolate or pedicellate, with small attachment to the thorax and without a continuation of the phragma and muscles ............... *Mymaridae*
5 (6) Tarsi, five-jointed ...................... *Ooctoninae*
6 (5) Tarsi, four-jointed .................... *Mymarinae*

In many of the species with elongate marginal vein, the apical portion of this vein is free from the costa, and is probably in reality the stigmal vein, which nearly continues the marginal in a straight line.

### *Gonatocerus.*

This genus seems likely to be identical with Section B of *Ooctonus* of Haliday. I have not seen any species of *Ooctonus* that would be placed in his Section A. *Ooctonus australensis* described by me, parasitic in the eggs of *Tettigonia* in Australia, is I think congeneric with *Gonatocerus cingulatus* from the same country and with the American species here described. All these have a distinctly petiolate abdomen, easily seen in dry mounts, but often hard to observe in balsam-mounted examples. The petiole is short and transverse and only slightly longer in my *Ooctonus australensis* than in the others, quite different from that of *Polynema,* which resembles the species of Haliday's section A. In my arrangement of the groups, as given above, *Gonatocerus* and *Ooctonus* would fall in the same group, as is probably natural, whereas in Ashmead's arrangement they are placed in different tribes.

### (1) *Gonatocerus rivalis* Girault.

Girault, Tr. American Ent. Soc. XXXVII, 257.

Mr. Koebele bred specimens, agreeing well with Girault's description, from eggs of a Jassid attacking sugar-cane, and I believe that the supposition of the latter, that his *G. rivalis* is the parasite of some water insect will prove erroneous.

Hab. Mexico, Morelos, Cuernavaca, Nov. 23rd, 1907. (Koebele).

### (2) *Gonatocerus mexicanus* sp. nov.

Pitchy brown, the abdomen mostly black, the antennae entirely dark, the two basal joints at most a little more pallid; occiput, the parapsidal furrows, and sutures of the mesothorax and base of abdomen paler, more yellowish; trochanters quite pallid, but the femora are notably for the most part dusky; middle and hind coxae yellowish. Described from specimens in balsam, as seen by reflected light. The color is probably darker in examples mounted dry.

The antennae of the female are long and slender, the funicle joints elongate, and differing little in length, the first appears slightly shorter than the second, which is about equal to the pedicel; the eighth funicle joint is slightly shorter than the seventh, which is about two and two-thirds as long as its width at the middle of its length. The club is as long as the eighth, seventh and half of the sixth funicle joints together. In the male the eight or nine apical antennal joints are about equal to the whole length of the insect measured from the front of the head; the pedicel is conspicuously shorter than the first funicle joint, being about two-thirds as long as this, the second funicle joint is also noticeably shorter than the first, the following joints subequal, the antepenultimate antennal joint nearly four times as long as wide. Front wing four times as long as its greatest width, or rather more, the general surface ciliation terminating in a point near the base of the marginal vein, the longest marginal cilia on apical portion of dorsal margin about one-half as long as the greatest width of the wing.

Sheath of ovipositor extended behind the apex of the dorsum of abdomen to a length considerably greater than that of the hind tarsi, or almost equal to the length of the abdomen. Length 1 mm. excl. ovipositor.

Easily distinguished from *G. maga* Gir. by the relative difference in the length of the club, the very long ovipositor, etc.

Hab. Mexico, Chapultepec; bred from Jassid eggs in grass, Nov. 23rd, 1907, No. 2548 (Koebele).

### (3) *Gonatoceus koebelei* sp nov.

Black, scape of antennae, all the legs and basal third of abdomen above yellow, pedicel of antennae more or less yellow, but sordid. Front wings with a very distinct large smoky spot occupying most of the apical fourth of their length, but not quite touching the margins. Thorax and abdomen somewhat shining, the former with microscopic reticulate sculpture, the meshes of the reticulation on the scutellum large. Propodeum with a median raised line. (Description thus far from dry specimens).

Antennae of female elongate, 11-jointed, all the joints elongate, the pedicel and second funicle joint about equal in length, but the former much the wider; first funicle joint a little shorter, the club is as long as the three preceding joints of the funicle and on its wide surface is considerably wider than these. The funicle joints differ very little in length, except that the 8th is distinctly shorter than the 7th, the latter being about twice as long as wide.

Antennae of male very long, all the funicle joints very long, and differing very little in length, the first being slightly shorter and also stouter than the second; the antepenultimate joint about three times as long as wide; pedicel distinctly shorter than first funicle joint, but more than half as long as this. Front wings about four times as long as their greatest width, the surface ciliation terminating basally in a pointed manner at the base of the marginal vein, the longest marginal cilia (of the dorsal margin towards the apex) one-third as long as the greatest width of the wing. Lower part of face, thorax and abdomen very sparsely clothed with longish dark hairs. Sheath of ovipositor extending behind apex of dorsum of abdomen for a length about equal to the three basal joints of the hind tarsi, or rather less than half the length of the abdomen. (Description from specimens in balsam). Length 1 mm. or more, excluding ovipositor.

Differs essentially from G.*rivalis* Gir. in that the sixth funicle joint is not small and shorter than the fourth, but is subequal to the fifth and seventh.

Hab. Mexico, Orizaba, Vera Cruz, bred from eggs of Jassid on sugar cane, Dec. 8th, 1907. (Koebele).

### (4) *Gonatocerus juvator* sp. nov.

Black (becoming paler in balsam) the basal part of the abdomen and the legs yellow, the front and hind coxae, hind femora widely on the apical portion, and the hind tibiae very conspicuously, black or dark. Scape and pedicel more or less yellowish in part, especially in balsam specimens. Wings noticeably, but lightly and evenly infuscate on their pilose portion.

Antennae of female with the first four funicle joints conspicuously short as compared with the following four; the pedicel is fully as long as the two first together or subequal to the fifth funicle joint. The first, second and third funicle joints are subequal, the second narrower than the others, the fourth is a little longer. The fifth to the eighth are subequal, the sixth not being noticeably shorter than the fifth or seventh; the latter twice as long as wide. Club subequal to the three preceding joints.

Antennae of male with the funicle joints all nearly equally elongate, the antepenultimate antennal joint being three times as long as wide. Front wings with the longest cilia one-third as long as the greatest width of the wing. The line of cilia which leaves the dorsal margin and runs inwardly to this terminates basally at the same point as the fringe of the dorsal margin, and does not meet the line of three or four cilia placed beneath the marginal vein. Consequently somewhat less than the basal half of the wing length is free from the general covering of hairs. Ovipositor not exserted beyond the dorsum of abdomen. Length about 1 mm.

In color this species is somewhat intermediate between *G. brunneus* Gir and its var. *tenuipennis,* the antennal structure being most like the latter. I do not think, however, that it can be considered as a mere race of *G. brunneus.*

Hab. Mexico, Cuantla, Movelos, bred from Fulgorid eggs on sugar-cane Dec. 10th, 1907; No. 2549 (Koebele).

### *Polynema giraulti* sp. nov.

Black, the abdominal pedicel yellow or reddish, the hind coxae also reddish or yellowish brown, the femora and tibiae are darker and infuscate, the apex of the former and base and apex of the latter on all the legs sometimes, but more noticeably on the front pair, being paler; the basal tarsal joint of all the legs pale. Second antennal joint more or less pale. Front wings with an antemedian transverse blackish fascia, and a pair of anteapical blackish spots, one near but not touching the costa, often of roundish shape, the other fainter and opposite this, near, but not touching, the margin opposite. This latter spot varies in size and intensity. Antennae long and slender in the female, the scape with scale-like sculpture of raised lines, in profile the margin appearing serrate, pedicel short and wide, first funicle joint very long, hardly shorter than the second, fourth, fifth and sixth wider than the basal ones and increasing in width, the sixth being long oval or subelliptic, the first joint one and a half times the length of this; club longer than two, but not so long as the three preceding joints. Male with filiform antennae, longer than the whole insect, the joints of the funicle all subequally elongate, parallel-sided, several times as long as wide, excepting the apical joint which is pointed. Front wings with punctiform, black, marginal vein; blunt and with the apical margin even slightly concave, the longest cilia about one-third as long as the greatest width of the wing. Hind tibiae distinctly serrulate, each tooth giving rise to a translucent seta, basal joint of hind tarsi much longer than the three following joints together. Abdominal pedicel in lateral view of equal height throughout. Length about 1 mm.

Hab. Mexico, collected amongst grass in cane-fields. (Koebele).

### *Polynema eucharis* sp. nov.

Yellowish brown or testaceous, transverse frontal ridge black, abdomen darker than the thorax and darker on the more apical segments than on the basal ones, the former being rather dark brown. Legs yellow, tarsi more or less infuscate above. Antennae with the first three joints yellow, the two following less clearly yellow and each with a minute basal black dot, three following dark fuscous or blackish, the large club joint on its wide surface, yellow.

The head and pronotum are sculptured or punctate and bear a white pubescence; the pronotum is long; the rest of the thorax very smooth and shining, impunctate or nearly, the parapsidal furrows distinct. Abdominal pedicel very elongate, fully as long or a trifle longer than the hind femora and concolorous with these, rather narrower near the apex than at the middle, many times as long as wide, the rest of the abdomen smooth and shining, narrow, elongate-ovate. Ovopisitor slightly exserted (in dry specimen).

Front wings rather more than three times as long as the greatest width, very slender on more than the basal third, so that the width at the base of the submedian fascia is not one-third the greatest width of the wing, the apical margin blunt and wide, their color white, the marginal vein nearly black, and with a slight infuscation beneath it, a very conspicuous dark fuscous, wide, submedian, transverse fascia, an equally conspicuous but narrower anteapical one, the basal margin of which is angulately indented about the middle and the apical side is angulately produced opposite the indentation; on the dorsal side the fascia is bilobed, so as to include a large white spot. Longest marginal cilia (near apex of dorsal margin) about one-third as long as the wing-width. Clothing of dark hairs regular over the wing surface and continued basally to beneath the marginal vein. Hind wings with numerous discal hairs; a dark band beneath the marginal vein and a second one occupying half the space between the former and the apex of the wing, but the apex of the wing itself is clear for some distance.

Antennae of female long, slender, scape short, wide, only about twice as long (including its basal pedicel) as its greatest width; distinctly shorter than the first funicle joint; pedicel about half as long as the first funicle joint, which is only about half the length of the second, the third about one-fourth longer than the second; fourth much shorter, between one-half and two-thirds the length of the third, or about three-fourths the length of the second; fifth a very little shorter than the fourth, but stouter; sixth very conspicuously stouter than the fifth, and about five-sixths its length; the fifth funicle joint is about seven times as long as its width at the middle, the apex being somewhat more dilated. Club very large, nearly two and a half times as long as the width at the middle of its length, subequal in length to the two preceding funicle joints. Length about 1.5 mm. The antenna is described from balsam specimen, rest of the insect from dry mount.

Hab. Fiji, Suva (Muir).

### *Eomymar* gen. nov.

Head transverse, ocelli in a very wide triangle, each of the outer ones about three times as far from the anterior ocellus as from the eye-margin. Antennae of the female 10-jointed, all the funicle joints very elongate, club-joint long and large, about equal to three preceding joints together; antennae of male 11-jointed. Pronotum extremely short, not or hardly visible in dorsal aspect. Tarsi 5-jointed. Front wings very narrow, dilated beneath the marginal vein on the dorsum, where they are widest, beyond this (apically) the dorsal margin is conspicuously sinuate; marginal cilia extremely long. Marginal vein long, continued into an elongate stigmal, which is consequently very oblique, and is bent towards the costa at its extremity; a submedian row of longish erect bristles, extending far back from the tip of the wing but not reaching the region of the neuration. First abdominal segment forming a short but distinct petiole, the abdomen behind this ovate, pointed at the apex, triangular in outline, with rounded base. Ovipositor not evidently exserted.

### *Eomymar muiri* sp. nov.

Black or dark brown (becoming lighter in balsam) shining, legs yellow, scape and pedicel of antennae more or less yellow, or at least paler than the funicle (sometimes quite yellow in balsam).

Scape in the female widest (on its flat face) near the middle, where it is obtusely angulated, the pedicel obconic, evidently longer than wide, shorter by one-third to one-half its length than the very elongate first funicle joint, which is slightly longer than the second. Three, four and five subequal, but the last of these is conspicuously wider than the fourth, the sixth still stouter, the seventh wider still, about twice as long as wide, hardly shorter than the preceding, though appearing so, owing to its greater width. Club subequal to the three preceding joints together. Antennae of male very long and slender, pedicel much shorter than the first of the funicle joints, these all very elongate and mostly not differing much in length, the first distinctly widened on its basal part, the seventh funicle joint about four times as long as its greatest width, or rather less.

Front wings about 12 or 15 times as long as the width beyond the middle; a row of bristles on the apical part of the wing along each margin, the bristles originating close to, and alternating with, the long marginal setae; another row is placed close to and just inwardly to each of these, while in the well developed submedian row the bristles are more or less irregularly placed in the series. Sheaths of ovipositor at most very slightly protruded beyond the dorsal extremity of the abdomen. Length about .5 mm.

Hab. Java, Pekalongan, bred from eggs of Delphacid, probably *P. vastatrix.*

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ENTOMOLOGICAL SERIES

BULLETIN No. 11

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

# PARASITES OF THE FAMILY *DRYINIDAE.*

BY R. C. L. PERKINS

HONOLULU, HAWAII.
SEPTEMBER 20, 1912.

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EMTOMOLOGICAL SERIES. BULLETIN No. 11

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

# PARASITES OF THE FAMILY *DRYINIDAE*.

BY R. C. L. PERKINS

HONOLULU, HAWAII.
1912.

# LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the Hawaiian
Sugar Planters' Association,
Honolulu, Hawaii.

Dear Sirs:

I herewith submit for publication as Bulletin No. 11 of the Entomological Series, an article by Dr. R. C. L. Perkins, Entomologist, entitled: "Parasites of the Family *Dryinidae*."

Yours very truly,

C. F. ECKART,
*Director.*

Honolulu, April 13, 1912.

# PARASITES OF THF FAMILY *DRYINIDAE.*

## *By R. C. L. PERKINS.*

In Bulletin I (p. 3-69 and p. 483-499) and Bulletin IV (p. 5-55) an account was given of the interesting parasites of the family *Dryinidae*. A number of figures was prepared by Mr. W. E. Chambers to illustrate these Bulletins, but as they were not completed until long after the letter press, they have never been published. I have, therefore, completed the working out of the material at present available and added some further general remarks, in order that the former bulletins may be rendered more complete, and that these excellent plates may now be published.

In 1907 a classification of the *Dryinidae* by Dr. J. J. Kieffer was published in "Wytsman's Genera Insectorum," wherein the family was divided into three subfamilies, *Dryininae*, *Gonatopodinae*, and *Anteoninae*.

The characteristics there given for the separation of the subfamily *Dryininae* are based on the shape of the stigma of the front wings, which is narrow or lanceolate, and on the fact that the hind angles of the pronotum do not reach back to the tegulae. In the males of the *Dryininae*, however, as in all *Dryinidae*, the prothoracic angles reach the tegulae, and I suspect that this is the case in some females assigned to the subfamily, e. g., *Bocchus* and *Chelothelius*, though I have seen no specimens of either genus, unless my *Eukoebeleia* be synonymous with the former. *Phorbas* Ashm. must certainly have the pronotal angles and tegulae meeting together. As to the form of the stigma, some genera have this in a condition more or less intermediate between the narrow, lanceolate-shaped ones and the large oval. This is the case with *Chelothelius* and the females of *Deinodryinus*, the former of which should, I think, be removed from Kieffer's Dryininae and placed in his Anteoninae, where *Deinodryinus* belongs, as is clearly proved by its male, which has a larger stigma and a form of antennae characteristic of the Anteon group. *Chelothelius* is probably parasitic on one of the *Jassoidea* (as evidenced by the structure of its chelae), a habit at present unknown in the winged *Dryinini*.

The small group *Emboleminae* of Ashmead should be placed as a subfamily of *Dryinidae*. Although the nervures of the wings in *Dryininae* and *Aphelopinae* are often for a large part effaced and colorless, their position can easily be made out. A comparison of the figures of such diverse genera as *Labeo, Embolemus* and *Aphelopus,* as drawn by Haliday (Ent. Mag. IV, Pl. XVI, Art. LIII), those of Ashmead (Mon. Proct. ), of Brues (J. New York Ent. Soc. XVIII, p. 15), and those given in this Bulletin, show the complete identity of the neuration throughout the *Dryinidae*. In some species of *Aphelopus,* where the distinct neuration is most reduced, even the line indicating the transverse cubitus is easily seen.

As I have previously stated, I consider the genus *Gonatopus s. l.* to be made up of groups entirely distinct phylogenetically, and the description of the remarkable Gonatopus-like creature, *Dryinopsis simplicipes* Brues, with 12-jointed antennae and simple front tarsi, confirms me in this opinion.

Little is known at present of the habits of the *Emboleminae,* but my Australian genus *Harpagocryptus* was bred from *Orthoptera* (Grylloids) and as similar, but quite distinct, larvae of *Dryinidae* have been found on very different *Orthoptera* in other parts of the world, it is possible that most, if not all, of the members of the *Emboleminae* are parasites on *Orthoptera.* It is interesting to note that the elongate larval sac of *Harpagocryptus* and *Aphelopus,* so different from those of all other *Dryinidae,* is correlated with the possession of simple front tarsi in the females. I have tabulated the few known genera of *Emboleminae* (so far as the females are concerned), but have omitted *Pedinomma,* the position of which is quite doubtful. *Algoa* of Brues must be extremely close to my *Harpagocryptus.* The condition of the labial palpi I consider to be of great importance in the wingless *Dryininae* of the Gonatopiform series, and consequently members of this series fall into different tribes.

It is clear that the classification of the *Dryinidae* must at present be based chiefly on the female structure, though the males, where known, are useful, as affording a clue to affinities. Of many species of *Gonatopus s. l.* males are very rarely obtained by breeding, so that many hundreds of the females may be raised without a single male appearing. Some, however, produce males more or less freely, while of some no males have yet been obtained. In America Mr. Koebele bred and captured many examples of various species of *Eugonatopus* and *Agonatopus,* but not a single male was disclosed.

## TABLE OF GROUPS OF *DRYINIDAE.*

1. (12) Front tarsi of both sexes simple not chelate.
2. (11) Wingless or subapterous, or if winged with median submedian and discoidal cells distinct, stigma small or narrow; labial palpi 3- or 4-jointed, antennae with 12 or 13 joints........*Emboleminae*

Females:

3. (6) Antennae 13-jointed.
4. (5) Fully winged .................... *Embolemus* West.
5. (4) Wings rudimentary ................... *Olixon* Cam.
6. (3) Antennae 12-jointed.
7. (8) Thorax as in *Gonatopus,* with a median stalk.... .............................. *Dryinopsis* Brues
8. (7) Mesonotum small, but not forming a narrow stalk,
9. (10) Apterous ............................. *Algoa* Brues
10. (9) With rudimentary wings ...... *Harpagocryptus* Perk.
11. (2) Winged, with large ovate or subtrigonal stigma, only the subcostal and radial nervures well defined; antennae 10-jointed, labial palpi 2-jointed. ................................. *Aphelopinae*
12. (1) Front tarsi of females chelate, antennae always 10-jointed ............................ *Dryininae*
13. (14) Stigma large, ovate, chelae rarely fully extensile front trochanters small, not elongated but almost like those of the other legs, (labial palpi 3-jointed), chelar claw always without denticles...... ..................................... *Anteonini*
14. (13) Stigma narrow or lanceolate; front trochanters always different from the others, being elongate, and often very long, chelae perfectly extensile, chelar claw in many genera with lamellate denticles; apterous species very numerous.
15. (16) Labial palpi 3-jointed .................... *Dryinini*
16. (15) Labial palpi 2-jointed ................ *Gonatopodini*

The males of the *Emboleminac* are little known, but in two of the genera they resemble the *Dryininae* in venation and in having only ten joints to the antennae. In the other groups they are distinguished as follows:

Subcostal and radial veins distinct, but no median, submedian or discoidal cells clearly defined; labial palpi 2-jointed, stigma very large .......................... *Aphelopinae*

Basal cells generally and frequently discoidal cells distinct or if the basal cells are defined only by hyaline nervures the the stigma is narrow or lanceolate ............. *Dryininae*

Stigma large and more or less ovate (labial palpi 3-jointed) ........................................ *Anteonini*

Stigma narrow or lanceolate, labial palpi 2- or 3-jointed.

Labial palpi 3-jointed; head never so strongly excavated posteriorly ...................................... *Dryinini*

Labial palpi 2-jointed; head always deeply emarginate posteriorly .................................. *Gonatopodini*

The males of the *Anteonini* are further generally easily separated by the rather different nature of the insertion of the scape of the antennae on its basal pedicel. The males of *Dryinini* and *Gonatopodini* are sometimes extremely similar, so that males of *Dryinus* and *Gonatopus* have been described by Ashmead under one Genus *Labeo*. This latter genus was characterized by Haliday as having short palpi, the maxillary three-jointed. I have males of *Gonatopus s. l.* with these characteristics, but *Labeo* of Kieffer is placed in his table under genera with "palpes maxillaires longs" and "palpes maxillaires de cinq articles." He remarks further that I state that the male of *Gonatopus s. l.* (i. e. *Labeo s. l.*) has bare eyes, but I find no such statement of mine, and have always known the eyes to be conspicuously hairy. As to *Chalcogonatopus*, I have discriminated this by its longer palpi, the labials being three-jointed, whereas the males of *Gonatopus* s. l. in Bulletin I (p. 22 and p. 33) are shown to have shorter palpi and the labials only two-jointed. Consequently the foot-note in Kieffer's work, p. 13, should be deleted. The male of *Chalcogonatopus* was not described at length because it could not be with certainty referred either to *C. optabilis* or *C. decoratus* (though doubtless belonging to one of these), and I did not care to give it a name, destined to become a synonym.

The structure of the thorax of the *Dryinidae* has been misunderstood both by Ashmead and Kieffer. Thus the latter, in referring to the *Dryininae*, in which the posterior pronotal angles do not reach to the tegulae, remarks that "les propleures les atteignent." The prothoracic pleura, however, are far removed from the tegulae and contribute largely to a lengthening of the prothorax anteriorly, while the space between the hind angle of the pronotum and the tegulae is occupied by the anterior part of the mesopleura, almost exactly as in some *Sphegidae*. In his figures showing the structure of *Gonatopus,* Kieffer, as did Ashmead in his descriptions, mistakes the hind lobe of the pronotum, when this sclerite is divided by a transverse furrow, for a part of the mesonotum. But the latter is formed in front solely by a narrow stalk, easily separable from the pronotum, which is movable upon it, and posteriorly a small scutellum is sometimes defined, articulating with the propodeum (or fused metathoracic and first abdominal segment) and also separable at the articulation. As a matter of fact, the large pronotum of *Gonatopus* is almost identical in structure with that of some winged forms, and its development is correlated with the great development in length of the front legs. It is interesting to note that in the winged *Dryinini* the mesonotum, though wide for the most part, is anteriorly narrowed into a small neck fitting into the pronotum, which is movable upon it. In some genera the parapsidal furrows extend back from this neck, and if the parts of the mesonotum exterior to the furrows be left out, a thorax extremely similar to that of *Gonatopus* results. But in full-winged forms, as is natural, no such reduction of the mesonotum ever takes place.

The close alliance of the tribes that I have recognized in the *Dryininae* is shown by the extreme resemblance of males of such forms as *Neodryinus* to those of some *Gonatopus s. l.;* and *Eukoebeleia* makes a great approach in some respects to the Anteonini. In making these studies I have critically examined about seventy species of *Gonatopus s. l.* and about fifty species of winged forms, in addition to a large number of European forms, winged and wingless. The greater number of these having been bred, I would specially refer to two points: (1) The variability of some species in color or sculpture, or both; (2) the importance of the form and armature of the claw of the chelae, which in the Gonatopiform species at once enables the parasite to be determined as to whether it attacks a Jassoid or Fulgoroid Homopteron. All the literature known to me on these insects has also been examined.

The arrangement of genera described in the Bulletins of this Station is as follows:

### APHELOPINAE.

*Aphelopus.*

### DRYININAE.

#### Anteonini.

*Anteon, Paranteon, Chelogynus, Deinodryinus.*

#### Dryinini.

*Neodryinus, Paradryinus, Hesperodryinus, Chlorodryinus, Perodryinus, Thaumatodryinus, Eukoebeleia, Apterodryinus, Eucamptonyx, Agonatopoides, Chalcogonatopus, Agonatopus.*

#### Gonatopodini.

*Echthrodelphax, Gonatopus, Dicondylus (Gonatopus m.), Pachygonatopus, Epigonatopus, Pseudogonatopus, Paragonatopus, Haplogonatopus.*

In my table of genera (Bull. IV, p. 9) the following corrections should be made:

4. (7) Labial palpi 3-jointed.
5. (6) Maxillary palpi 6-jointed.
a. (b) Chelar claw normal, with minute ante-apical tooth. .................................. *Apterodryinus*
b. (a) Chelar claw strongly bent on the apical portion..... .................................. *Eucamptonyx*
6. (5) Maxillary palpi 5-jointed ............ *Agonatopoides*
10. (11) Pronotum divided by a transverse impression..... .................................. *Paragonatopus*
11. (10) Pronotum not so divided .......... *Haplogonatopus*

On page 40 (seventh line from the bottom), for "fourth" read "fifth."

### DRYININI

### *Paradryinus terryi* sp. nov.

Black, the apex and sides of clypeus, the scape of the antennae, their three apical joints and most of the one preceding these, pale yellowish. Front coxae yellowish brown, dark at the sides, the tips whitish, trochanters dark at the base, red apically. Front femora red above, and beneath dark at the sides, tibiae pale above. Middle and hind coxae and femora dark reddish, the tibiae dull blackish; metatarsi more or less infuscate, the more apical joints testaceous; apex of abdomen more or less pale. Wings with only two dark fasciae, the narrow middle one being confluent below with the basal one, the submedian cell being entirely dark on its apical portion, the median cell clear at the apex.

Head dull, longitudinally rugose and with minute surface sculpture; third antennal joint about twice as long as the fourth, the latter and the fifth notably widened, the following ones being considerably thinner. Pronotum longitudinally rugose, very finely so on the disc, more strongly at the sides, and in front with a lateral smooth, polished area. Mesonotum very dull, with extremely fine sculpture medially between the parapsidal furrows, which are distinct, and much more roughly sculptured outside these. Propodeum above with regular longitudinal wrinkles, posteriorly and laterally strongly reticulate. Abdomen black or nearly so, not red basally, very smooth and shining. Length 8 mm.

Somewhat resembles *P. gigas,* but very distinct by the color of the wings, antennae and abdomen, and the quite different mesonotal sculpture.

Hab. China, Hong Kong; a single example collected by the late Mr. F. W. Terry.

### *Paradryinus javanus* sp. nov.

Black, the face below the antennae pale, the scape and second joint of the antennae in front yellow, the following joints brownish or brownish testaceous, the apical joint clear testaceous. Legs brown or testaceous, the hind and middle tarsi pallid, paler than the tibiae. Pronotum rufescent along the hind-margin and at the sides, the anterior margin very narrowly pale. Wings with the usual three transverse fasciae distinct, the basal one being well separated from the narrow median one by the hyaline apical portions of the median and submedian cells.

Head dull, densely sculptured and with some fine longitudinal wrinkles. Pronotum with dense, fine sculpture, mesonotum dull with dense sculpture, distinctly smoother and sometimes a little shining in the middle between the fine parapsidal furrows.

Propodeum reticulately rugose. Basal joint of front tarsus distinctly longer than the fourth. Abdomen very smooth and shining, the apex rufescent. Length 3-4 mm.

Judging from the three specimens that I have seen, this species varies somewhat in sculpture and in the color of the antennae and legs, the smallest example having the antennae of a testaceous yellow and very little darkened. It is closely allied to the Australian *P. leptias,* but that is easily known by the four pallid apical joints of the antennae strongly contrasted with the dark preceding ones, the less distinct separation of the basal and median fasciae of the wings, and the very dark femora and tibiae of all the legs, while the middle and hind tarsi are also fuscous above.

Hab. Java, Pekalongan (Muir); bred from nymphs of *Thanatodictya* (No. 317, 367 and 295).

### GONATOPODINI

### *Pseudogonatopus nudus* sp. nov.

Face, mandibles, and two basal antennal joints pale yellowish, head above and the thorax bright brown, the mesonotal constriction evidently paler or yellowish, femora more or less sordid brown, the hind and middle tibiae and tarsi and all the trochanters more pallid. Abdomen with the petiole black, a ferruginous area behind this, the rest nearly black.

Head above concave, somewhat shining; antennae moderately long and slender, third joint thin and very much longer than the fourth, the apical joint dark. Pronotum with distinct transverse furrow, shining, very feebly sculptured and without hairs, mesonotal constriction dull, with very dense microscopic surface sculpture; propodeum smooth and shining on the disc, posteriorly at the sides very feebly transversely rugulose, the wrinkles less definite in the middle, without erect hairs. Abdomen glabrous and polished. First and fourth tarsal joints of front legs subequal, the claw with about six well developed lamellate denticles. Length 2.75 mm.

Hab. Java, Pekalongan (Muir); bred from a *Dicranotropis* (No. 349); larval sac nearly uniform dark fuscous, placed near the base of the abdomen of the leaf-hopper.

### *Pseudogonatopus hospes* sp. nov.

Black, the face below the antennae and two basal joints of these pale, the pale color of the face continued above the antennae in the middle line and along the inner orbits. Front, middle and hind coxae dark above, pale beneath and at the apex, front trochanters more or less brown above on the thickened portion, tibiae testaceous, the front ones darkened in front and behind, tarsi testaceous; apex of abdomen pale; the hind femora have a paler area between the darkened base and apical portion, while the front ones except at the extreme apex are nearly uniformly dark brown.

Head strongly concave between the eyes, minutely microscopically sculptured, so as to be not much shining; antennae longish and slender, the third joint one and two-thirds the length of the fourth, or rather longer still, black the extreme base only pale, the fourth hardly wider than it. Pronotum very distinctly divided, with dense surface sculpture, appearing punctate under a strong lens, mesonotal constriction with similar dense sculpture, behind which the propodeum in front of the spiracles is transversely rugose, as also on its posterior surface, while between these areas it is sculptured much like the pronotum. The whole thorax is without any erect pubescence. Front coxae very long, three times as long as high, the trochanters with long thin basal stalk, the chelae normal for the genus, the claw bearing about eight or ten well developed lamellate denticles, the anteapical marginal tooth of the lower side distinct. Abdomen with minute, but distinct, microscopic sculpture, so that it is not highly polished, almost without pubescence, the apical margins of the segments generally more or less paler. Length 4 mm.

Hab. Java, Pekalongan, and China (Muir). This species was established in the islands from cocoons sent from China.

### *Paragonatopus nigricans* P.

To this genus and species must be referred the unique specimen described as *Pseudogonatopus melanacrias.* Mr. Muir has taken this in Fiji, the original locality, and I have dissected out and examined the palpi. It varies in color, the usually black propodeum being sometimes red on the disc, while one example, which appears specifically identical, has the whole thorax of a bright ferruginous yellow.

### GONATOPUS.

According to Kieffer this genus has four-jointed maxillary palpi and is therefore the same as my *Neogonatopus,* while the species of *Gonatopus* previously described by me should be referred to *Dicondylus* Hal.

### *Gonatopus anomala* sp. nov.

Face pale, the mandibles and front of scape, yellow, the head above dark brown, two basal joints of antennae pale, third infuscate, the rest dark fuscous or black. Thorax brown, the propodeum of darker shade than the pronotum, tarsi pale testaceous, the femora and middle and hind tibiae darker, sordid. Abdomen blackish, paler basally behind the petiole.

Head above shining and concave between the eyes, the antennae with the third joint one and a half times as long as the fourth, or more. Pronotum with some sparse erect hairs, feebly sculptured, in side view simply convex above, the transverse division being absent. Propodeum with very sparse, but distinct, erect, longish hairs, shining above both in front of and behind the spiracles, its posterior face distinctly transversely rugose. All the femora with distinct, erect, pale hairs, first and fourth joints of front tarsi subequal, chelae normal for Jassid parasites. Abdomen polished, clothed sparsely with distinct pale hairs. Length 3 mm.

This species is remarkable for the simple pronotum and is doubtfully placed under the genus *Gonatopus*. The maxillary palpi are very short, and perhaps there is only one joint beyond the flexure.

Hab. Fiji, bred from Jassid (Muir).

### *Dicondylus perpolitus* sp. nov.

Deep black, for the most part highly polished. Face below the antennae, and for a short way above these along the eye margins, and the mandibles, pale. First three antennal joints testaceous or the third more or less dark. All the coxae black or nearly so and clothed with sparse pale hairs, the trochanters and tibiae paler, the tarsi quite pale testaceous.

Head above with excessively minute microscopic reticulation, which does not prevent it from being shining, the vertex with sparse, short, white hairs.

Antennae moderately stout, the thin third joint about one and a half times as long as the fourth. Pronotum with well marked transverse division, very highly polished, the hind lobe with fine indefinite punctuation; mesonotal constriction rugulose, the thorax behind the constriction with evident pale hairs beneath and at the sides, but above almost glabrous, posteriorly finely transversely rugose, on the disc highly polished. Femora with short, inconspicuous, pale hairs. Basal joint of front tarsi about equal to the fourth joint, thin basal portion of front trochanters short, chelae normal for Jassid parasites. Abdomen very smooth and shining, with a few short and inconspicuous hairs. Length 3 mm.

Hab. Java, Pekalongan (Muir).

### *Dicondylus plebeius* sp. nov.

Brown or ferruginous, the head above generally darker brown, the abdomen black, but with a ferruginous spot behind the pedicel; mandibles (more or less) and front of scape yellow, second and usually more or less of the third joint of antennae testaceous, the following joints black. Pronotum and other parts of the thorax sometimes with darker markings. Front femora and sometimes the tibiae more or less darkened, the apices of the former pallid. Mesonotal constriction evidently paler than the adjoining parts of the thorax.

Head above concave, usually not highly polished, though more or less shining, clothed with erect hairs posteriorly. Third joint of antennae about one and a half times as long as the fourth, the latter considerably stouter. Pronotum and disc of the propodeum highly polished, the mesonotal constriction dull, the thorax bearing scanty erect hairs; the propodeum posteriorly very finely transversely rugulose.

First and fourth joints of anterior tarsi subequal, chelae of the usual type in Jassid parasites. All the femora with distinct clothing of sparse erect hairs. Abdomen shining, sparsely clothed with distinct erect hairs. Length 3 mm.

Closely allied to *Gonatopus australiae,* but distinguished by the ferruginous propodeum with shorter hairs, and the distinct abdominal pubescence, which is not confined to the base.

Hab. Java, Pekalongan (Muir); bred from nymph of Jassid; larval sac dull black, placed ventrally on the abdomen of the leafhopper.

### *Dicondylus javanus* sp. nov.

Black, the face below the antennae, and the scape in front yellow, the following antennal joints testaceous, the three or four apical ones dark fuscous or black; trochanters, tibiae and tarsi of all the legs pale, the front tibiae browner outwardly, the trochanters sometimes marked with brown, apex of hind tibiae darkened, the tip of all the femora pale.

Head above strongly concave, very minutely and closely sculptured, so that it is not very shining, with a distinct fine median raised line. Third antennal joint long and slender, one and a half times the length of the fourth or rather more, fourth distinctly longer than the fifth, eighth about two and a half or three times as long as wide. Pronotum transversely grooved before the middle, densely minutely sculptured, much more strongly than the head; behind the transverse groove dull or nearly so, as is the mesonotum and the propodeum, the latter finely transversely rugulose posteriorly and also on the part in front of the stigmata, without erect hairs on its dorsal surface. Front tarsi with the fourth joint very little shorter than the first, fifth beneath with two rows of lamellate denticles on the apical part of its thickened portion and the apical curved part also armed with denticles; claw with a few fine hairs beneath, as usual in Jassid parasites. Legs without erect pubescence. Abdomen very smooth and shining with a very few short appressed hairs, the extreme apex more or less red. Length 3-3.5 mm.

Hab. Java, Pekalongan (Muir); bred from *Deltocephalus;* larval sac abdominal on mature leaf-hoppers, dark fuscous, dull and densely sculptured, or minutely shagreened, more or less variegated with pallid color.

## ANTEONINI

### *Chelogynus cognatus P.*

This species is synonymous with *Prosanteon chelogynoides* (*op. cit p.* 66).

The chelae being obscured with gum in the single carded specimen, I misunderstood the true nature of the front tarsi, until recently, when these were cleaned. This example differs a little in color from the type of *P. chelogynoides* and was bred from a different genus of Jassidae, but the differences seem too small to be of specific value.

# CHALCIDOIDEA

## ENCYRTIDAE

### *Echthrogonatopus hawaiiensis* sp. nov.

Metallic green, the abdomen except at the base, the pleura and propodeum purple. Front and middle tarsi, apical joints of the hind tarsi and apex of middle tibiae yellow. Apex of middle and sometimes of front femora and extreme base of their tibiae also more or less pale. Antennae entirely dark. Front wings blackish fuscous from near the base of the marginal vein to the apex, the dark part including a large hyaline costal spot, originating (on the basal side) at the apex of the post-marginal vein and extending longitudinally nearly half the distance from this vein to the tip of the wing, but transversely not reaching its middle; opposite this on the dorsum is an elongate hyaline area. At the extreme base the wing is again dark. A distinct bare line runs obliquely from beneath the marginal vein in the dark portion of the wing to become lost in an extensive bare area in the hyaline portion.

Head dull, with minute surface sculpture, and a single row of shallow punctures on each side bordering the inner margin of the eyes. Antennae with the second, third and fourth joints small transverse, fifth and sixth distinctly larger and also transverse, club nearly as long as the funicle. Mesonotum shining, with excessively fine microscopic surface sculpture, and a few feeble punctures, thinly clothed with pale hairs; scutellum similarly clothed, darker and duller than the mesonotum; pleura shining. Abdomen with the usual group of long setae on each side towards the base, which is very shining. Length 1.5 mm.

Allied to *E. exitiosus* of Australia, but very distinct. The hairs on the eyes are very indistinct, if not altogether absent.

Hab. Hawaiian islands, Oahu; parasitic on *Pseudogonatopus perkinsi*.

### *Cheiloneurus javanus* sp. nov.

Face, scutellum, the axillae, propodeum, pleura, and the middle of the abdomen yellow and in parts whitish yellow; head above sordid, the pronotum and mesonotum dark fuscous, submetallic in some aspects, head behind the eyes and cheeks distinctly metallic, base and tip of abdomen dark, the former brightly metallic. Antennae pale yellow or whitish, with black club. Wings hyaline at the base, infuscate from the base of the marginal vein apically, but the dark part with a hyaline margin of irregular width extending round from the region of the post-marginal vein to the dorsum opposite this vein. The infuscation itself is darker in some parts than others. Legs pale, the hind femora generally a little darkened at the apex.

Ocelli in an isoceles triangle, of which the sides are about twice the length of the base, the surface of the head between the eyes dull, densely microscopically sculptured. Mesonotum densely clothed with silvery short pubescence; scutellum sparsely clothed and with the usual tuft of erect black hairs; mesopleura dull. Abdomen shining metallic at the base. Length 1 mm.

Hab. Java, Pekalongan (Muir); parasitic on *Paradryinus*. (No. 352).

Obs.—In my description of *C. gonatopodis* (Bull I, p. 261, line 14), for "basal half" read "apical half."

# EXPLANATION OF PLATES.

## PLATE I.

1. *Gonatopus haplothorax,* female (Bull. Ent. H. S. P. A. Exp. Station IV, p. 35).
2. *Agonatopus synchromus,* female (Bull. IV, p. 33).
3. *Haplogonatopus apicalis* (?), male (Bull. I, p. 39).
4. *Haplogonatopus americanus,* female (Bull. I, p. 40).
5. *Agonatopus ferrugineus,* female (Bull. IV, p. 30).

## PLATE II.

1. *Paradryinus venator,* female (Bull. I, p. 55).
2. *Neodryinus koebelei,* male (Bull. I, p. 51).
3. *Echthrodelphax bifasciatus,* female (Bull. I, p. 49).
4. *Paradryinus venator,* male (Bull. I, p. 55).
5. *Neodryinus koebelei,* female (Bull. I, p. 51).

## PLATE III.

1. *Hesperodryinus arizonicus,* male (Bull. IV, p. 42).
2. *Chlorodryinus pallidus,* male, (Bull. I, p. 57).
3. *Chlorodryinus pallidus,* female (Bull. I, p. 58).
4. *Hesperodryinus amphiscepae,* female (Bull. IV, p. 41).
5. *Echthrodelphax fairchildii,* female (Bull. I, p. 49).

## PLATE IV.

1. *Chalcogonatopus leptias,* female (Bull. IV, p. 17).
2. *Paranteon myrmecophilus,* female (Bull. IV, p. 46).
3. *Deinodryinus paradoxus,* female (Bull. IV, p. 46).
4. *Chelogynus typicus,* female (Bull. I, p. 61).
5. *Apterodryinus torvus,* female (Bull. IV, p. 14).

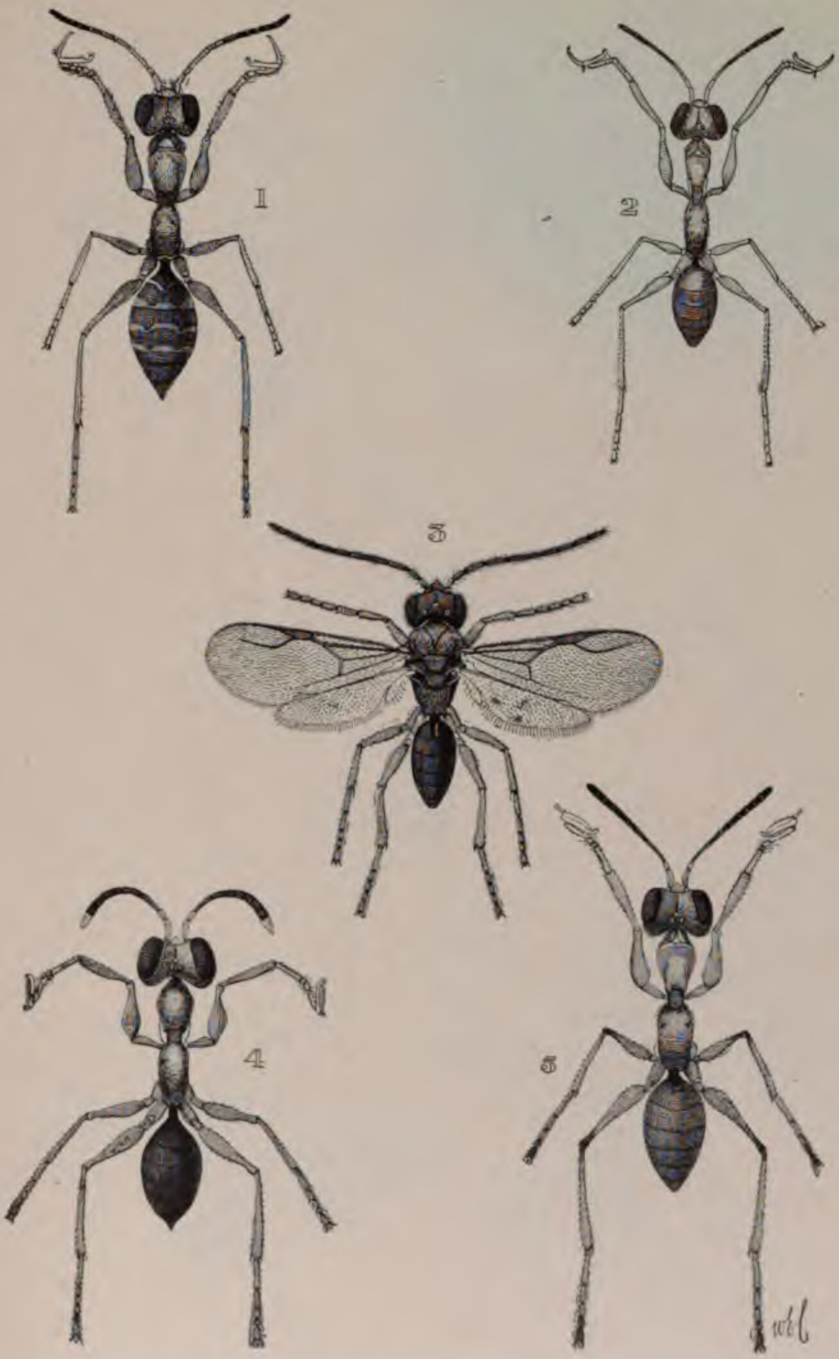

PLATE I.

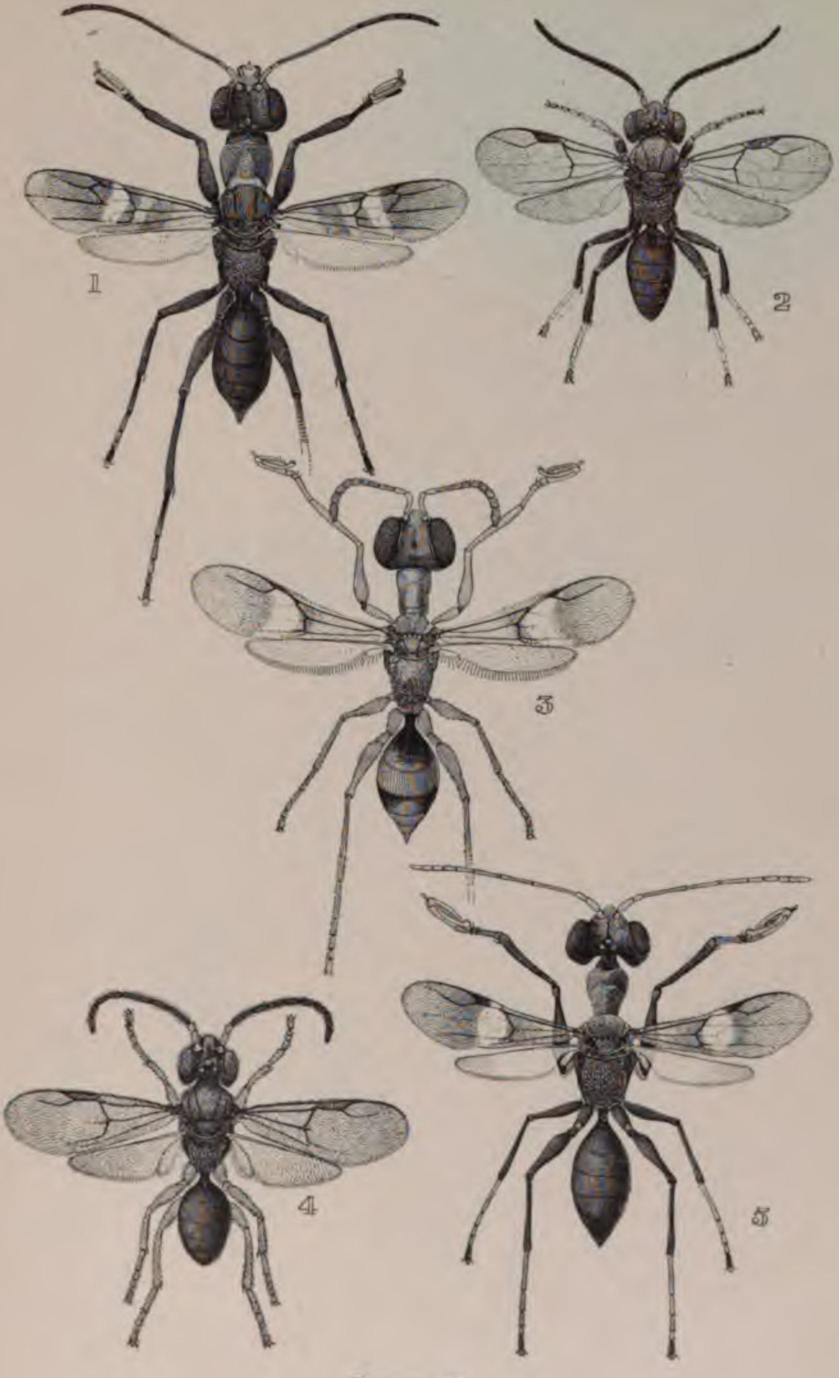

PLATE II.

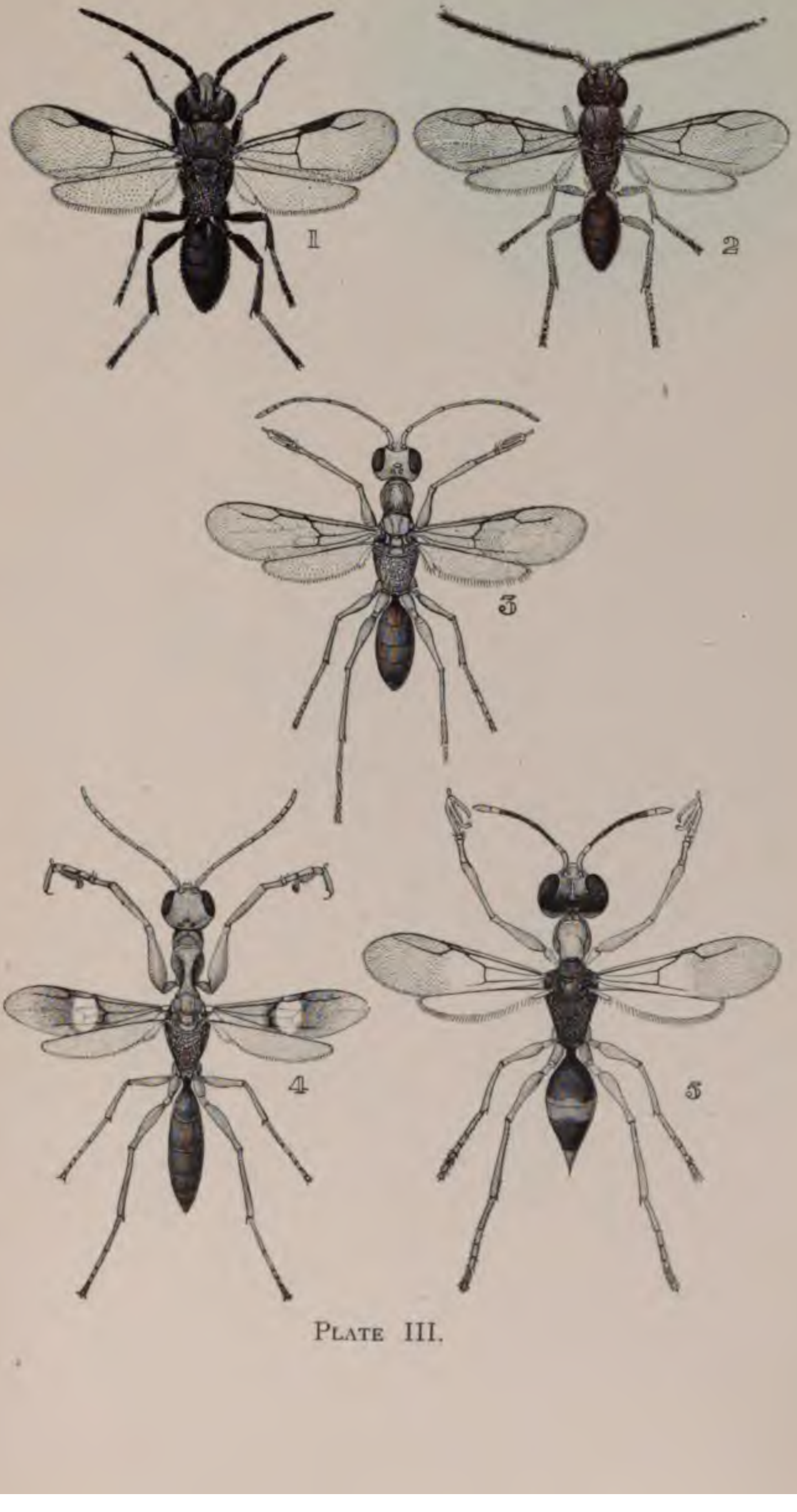

Plate III.

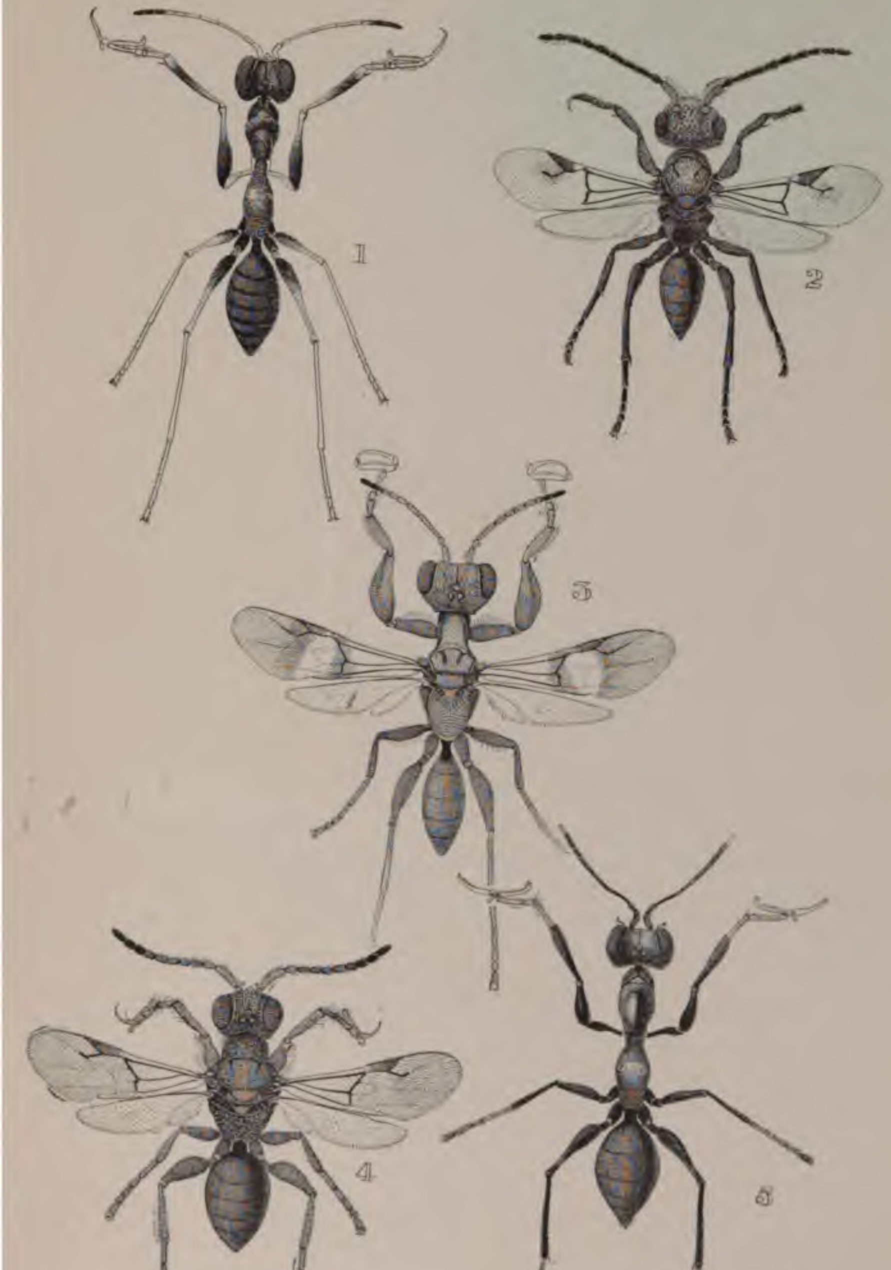

PLATE IV.

## HAWAIIAN SUGAR PLANTERS' ASSOCIATION

### OFFICERS AND TRUSTEES FOR 1913

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| E. F. BISHOP | Vice-President |
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| L. J. WARREN | Assistant Secretary-Treasurer |
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| A. W. T. BOTTOMLEY | F. KLAMP |
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| R. C. L. PERKINS | Entomologist |
| NOEL DEERR | Sugar Technologist |
| H. L. LYON | Pathologist |
| S. S. PECK | Chemist |
| H. P. AGEE | Agriculturist |
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| A. E. JORDAN | Assistant Chemist |
| A. KOEBELE | Consulting Entomologist |
| OTTO H. SWEZEY | Acting Entomologist |
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| ALDEN T. SPEARE | Assistant Pathologist |
| W. P. NAQUIN | Assistant Agriculturist |
| D. C. BRODERICK | Sub-Station Superintendent |
| G. H. TUTTLE | Cashier |
| W. R. R. POTTER | Illustrator |
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| A. WARREN | Clerk |
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| J. F. MELANPHY | Fertilizer Sampler |

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ENTOMOLOGICAL SERIES

BULLETIN NO. 12

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

# On Some New Species of Leaf-Hoppers

BY G. W. KIRKALDY AND F. MUIR

HONOLULU, HAWAII
JANUARY, 1913

595
H389

# LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the
Hawaiian Sugar Planters' Association,
Honolulu, Hawaii.

DEAR SIRS:—I herewith submit for publication as Bulletin No. 12, of the Entomological Series, a collection of notes by the late Mr. G. W. Kirkaldy and by Mr. F. Muir, entitled: "On Some New Species of Leaf-Hoppers."

Yours very truly,

C. F. ECKART,
Director.

This Bulletin consists of descriptions of some of the new species of Fulgoroidea in the collection of the Hawaiian Sugar Planters' Experiment Station, collected by Mr. Koebele and myself during our investigations abroad.

The first part is from manuscript notes left by the late Mr. G. W. Kirkaldy. The delay in publishing these descriptions is to be regretted, as some of the names may now be synonyms, but the illness and sudden death of Mr. F. W. Terry, who had the disposing of the library and papers of his former friend and colleague, has been the cause of the delay, and now the doubly sad task falls to me. I publish Kirkaldy's notes as he left them, uncorrected, as my present knowledge of some of the families he deals with is not sufficient to allow me to correct his work.

The second part is by myself, with a few of Kirkaldy's descriptions incorporated. It deals only with the family Derbidae.

F. M.

## PART I.

By the Late G. W. KIRKALDY.

### FAMILY *CICADIDAE.*

(The following are not arranged phylogenetically.)

#### *Cicada pontianaka* Distant.

Hab. Borneo, Pontianak Muir. Previously recorded also from the Malay Peninsula, Sumatra, Java, and Sulu. The two males before me agree generally with Distant's figures and descriptions, except that either they differ a little as regards the pygophor, or else his figures are bad.

#### *Platypleura canescens* (Walker).

Hab. Larat (Muir). Previously also from Sumatra, Banda, Timor Laut, and Aru.

#### *P. nobilis* (Germar).

Hab. Borneo, Telok Ayer (Muir). Previously from India, Assam, Java, and Sumatra.

#### *P. lyricen* sp, nov.

Male and female closely allied to *ciliaris* (Linneus). Pale greenish-ochraceous; vertex with a large median piceous suffusion which is continued to the margins by broad lines as follows: two lateral on each side (the second actually on the fastigia), and five basal, so that the vertex seems to be piceous with about six marginal pale areas; frons more or less piceous basally, some markings on legs, the tarsi, apex of labium, etc., blackish. Pronotum with a blackish line down the middle reaching to the anterior margin of the hind reflected part, and two or three short oblique lines on each side of this. Mesonotal markings much as in *ciliaris,* anterior half or so of the urotergites dark piceous, the last two or three segments mostly so. Urotergites more or less clouded with fuscous. Tegmina whitish tinged with fawn, with pale golden-yellow pubescence; veins pale yellow, green and red; clavus and base of corium dark, a fuscous oblique band from the exterior margin to the apex of the clavus, on basal third; the middle third and a little apical of that has a number of dark (thinly margined) rings in two or three rows (which in one doubtful female are almost absent), the apical margin is irregularly fuscous. Wings dark orange-brown, marked much as in *ciliaris*, but much more strongly and clearly cut, with blackish brown.

Structurally this species differs from *ciliaris* in the male by the opercula being remote inwardly, the inner margin, in fact, not extending quite so far inwardly as the hind coxae; they are transverse, and the spine of the hind coxae is long and acute. The male pygophor is bluntly carinate beneath down the middle, apically truncate, very slightly emarginate, broadly sulcate, this sulcation widening in the middle.

Length 9-12 mm.; width of pronotum 10½-11 mm.; expanse of tegmina 60-67mm.

Hab. Ambonia (Muir).

### *Baeturia conviva* (Stal).

Hab. Amboina and Larat (Muir). Previously from Papua and almost all the Austromalayan Islands. Doubtfully distinct from *B. exhausta* (Guérin)

### *Scieroptera splendidula* (Fabricius).

Hab. Java, Pekalongan, Borneo, Moewong (Muir). Previously recorded from throughout the Oriental region, except the Philippines. The examples before me are intermediate between *splendidula* and *crocea;* they differ from the latter, to which they are more immediately referable, by the immaculate black head, the pale bronzy-fuscous tegmina, with the cells medially paler.

### *Huechys vidua* (A. White).

Hab. Borneo, Moewong (Muir). Previously from the Malay Peninsula.

### *H. sanguinolenta* (Fabricius).

Hab. Macao (Muir). Distributed over almost the whole Oriental region as well as Sumbawa and Timor Laut.

### *Prasia elegans* sp. nov.

Female bright yellowish-green; the apical margin of the head dorsally, narrowly, the base of the vertex, its porterolateral angles broadly, a large portwine glass-shaped mark on the mesonotum, all the mesonotal margins narrowly (excluding the basal elevation), and two submedian wedges, velvety-blackish. The head dorsally with sparse, short, black hairs. Abdomen above brownish-orange basally and laterally (irregularly) blackish. A silvery pubescent spot basolaterally and a percurrent stripe of silvery pubescence across the fifth urotergite. Beneath blackish with sparing pubescence of mixed silvery and pale golden pubescence. Fore and middle coxae dark crimson, margined narrowly with black, femora black with a broad red stripe inwardly; tibiae and tarsi crimson. Hind legs yellowish testaceous, femora and coxae more or less sanguineous. Tegmina hyaline, basal half of subcostal and radical veins on basal fifth yellow, shading to green up to about the middle, the rest black. Wings hyaline, subcostal and the base green, rest black.

Head dorsally slightly longer than wide between the eyes, vertex produced a little in front of the eyes, apical margin, where not interrupted by the frons, truncate; dorsal part of frons nearly or quite as long as the vertex medially, the latter deeply rotundately emarginate to receive it, anterolateral angles of the middle part of the vertex acute, prominent. Pronotum as long as, or slightly longer than, the head.

Length 15 mm.; width of base of pronotum 6 mm; expanse of wings 46 mm.

Habitat, West Borneo (Muir).

### *Cosmopsaltria alticola* Distant.

Hab. Borneo, Pontianak (Muir).

Variety *Pontianaka* nov. This agrees generally with Distant's description, except that the apical veins have each an infuscate spot near the apex.

### *C. spinosa* (Fabricius).

Hab. Borneo, Pontianak (Muir). The basal sides of the first, second, third, fourth, fifth, and seventh apical cells are infuscate, and the male opercula extend nearly to the apical margin of the fifth urosternite, not of the fourth, as figured by Distant, otherwise these examples accord.

### *C. duarum* (Walker).

Hab. Borneo, Pontianak (Muir). Previously also from the Malay Peninsula.

### *Leptopsaltria pryeri* Distant.

Hab. Borneo, Telok Ayer (Muir).

### *Pomponia imperatoria* (Westwood).

Hab. Borneo, Telok Ayer (Muir). Previously also from Malay Peninsula, Java, and Sarawak.

## FAMILY *CERCOPIDAE.*

### Subfamily *Machaerotinae.*

I consider that the *Machaerotinae* are simply *Cercopidae* with simplified venation, both of tegmina and wings, and with more or less produced nota; they are a side branch of the *Cercopidae,* and *in no way* a link between them and the *Membracidae,* which are a development of the *Tetigoniidae* (or "*Jassidae*") and lie right on the other side of the latter. The *Membracidae* are simply *Tetigoniids* with modified face and legs, and with a more or less ornamental nota. This development is merely analogical between the *Machaerotinae* and *Membracidae,* and *in no way* homological, as in the former it is mesonotal, in the latter pronotal!

### *Pectinariophyes* Kirkaldy.

The hind tibiae are bispinose, but the basal one is minute.

### *Polychaetophyes* Kirkaldy.

This genus is very close to *Machaeropsis* Melichar, and may prove identical. The head, however, is much shorter and broader, and very much more declivous, the face is broader and shorter, the scutellum is scarcely, or not at all, grooved mediolongitudinally, and the apical cells of the tegmen are four or more, though two or more of these are small.

### *Machaerota moluccana* sp. nov.

Apparently allied to *M. ensifera* Burmeister, but the scutellum is tricarinate, its process much more arched, and the pronotum is not striped.. Purplish piceous; the pronotum browner along the posterolateral margin, and the scutellum with a short whitish longitudinal streak basally on each side; the process is brownish-yellow. The face is unicolorous, but has thin, lateral, silvery, radiating lines. Fore and middle legs brownish-yellow; hind legs brownish-piceous. Sterna and base of abdomen beneath partly pale. Tegmina yellowish-hyaline, veins brownish-yellow, the costa and subcosta darker for the greatest part of their length. Wings hyaline, veins blackish-brown. Vertex scarcely, though very nearly, as long as in *ensifera,* rounded anteriorly, rather longer than wide between the eyes (or at least as long). Venation of clavus much as in *ensifera*. The rest of tegmen agrees fairly well with that of *ensifera* as figured by Schmidt, though not by Distant. The scutellum is more arched and the posterior margin is vertical and nearly as long as the distance between it and the pronotum; it is strongly compressed and tricarinate along the top, the lateral keels being evanescent anteriorly, the middle one evanescent posteriorly; the process is arched and rounded, the posterior being deflected. Head and pronotum slightly carinate longitudinally.

Length to apex of abdomen 6½ mm.; to apex of process in straight line 9½ mm.; to apex of closed tegmina 8¾ mm.

Habitat Amboina (Muir, Nov., 1907).

## FAMILY *FULGORIDAE*.

The type of the genus *Fulgora* has been wrongly determined by all recent authors. The genus was erected by Linneus in 1767 (Syst. Nat. (Ed. 12) I 703), and the type was fixed by Sulzer in 1776 (Abgek.Gesch. Ins. 85), as *europaea* Linneus. This being the earliest genus, the superfamily and family take their names from it. For *Fulgora* auctt. (type *laternaria* Linneus), the name *Laternaria* Stal 1866 should be used. The subfamily formerly known as "*Fulgorinae*" should be known as *Lystrinae*.

### Subfamily *Lystrinae*.

### *Cyrpoptus suavis* Stal.

Habitat Mexico, Cuernavaca (Koebele). The males are as figured in the "Biologia," but the females have the orange-yellow of the tegmina and wings replaced by sanguineous; the head, pronotum and scutellum are pale reddish-brown and the tergites dark orange-brown, in the latter sex.

### *Birdantis* sp.

A somewhat immature specimen from Amboina (Muir), may be *delibuta* Stal (from Ternate), but I can not obtain the description; it is not *decens* or *pallescens*. If this specimen is, as I suppose, a *Birdantis*, then Stal was right in supposing that it ought to be placed in his "54" division, as the "claval vein" runs into the commissure before the apex of the clavus.

### *Scamandra merope* sp. nov.

Apparently near *S. hecuba*, but differently colored. The upper surface dark greenish-brown; metanotum and underside, with legs, mostly blackish-brown, the femora very obscurely spotted with brown. Tegmina bright red-brown on basal three-fifths, rest yellowish-brown; an irregular, non-continuous blackish fascia across the tegmina just basal of the division; there are also one or two obscure spots on the basal part. Veins mostly concolorous with the ground color; the costal vein, basal cell, etc., blackish. Wings scarlet; a basal spot bluish-black; apical third continuous with hind margin and anal area, yellowish-brown, paling gradually to anal area. The red discal color is bordered apically with blackish. Two large spots on the vertex; the scutellum; abdomen above especially basally; some specks on the gastropleurites; and the tegmina largely, as well as some specks on the wings, covered with a cretaceous exudation. The frons is longer than wide, and there is a rather obscure sublateral keel (on each side), and an obscure median one only extending about one-third of the length. Apical half of clypeus keeled.

Length 18 mm.; expanse 53 mm.

Hab., Telok Ayer and Pekalongan (Muir).

### *Eurinopsyche arborea* sp. nov.

Differs from *obscurata* by the size of the eyes, which in the latter are small, but in *arborea* occupy almost the whole height of the head in profile. The head is rather shorter than the abdomen, and the labium extends to the apex of the latter.

Length 20½-21 mm.

Hab.: Queensland, Brisbane, and Bundaberg (Perkins); arboreal.

## Subfamily *Fulgorinae* (=*Dictyophorinae* Oliv.)

### *Udugama splendens* (Germar).

I refer to this species some examples from Macao (Muir; also in my collection from J. C. W. Kershaw). It has also been recorded from India, Ceylon, Burma, Philippines, and Java. The sexes are somewhat dissimilar in size and color. The examples before me may take the varietal name *tibialis*, the fore and middle tibiae being distinctly bi- or triangulate with brownish, a character not apparently mentioned in any descriptions of the typical form. Melichar adds *Dictyophora indiana* Walker as a synonym, a name which Distant ignores.

### *Electryone* gen. nov.

Differs from *Putala* Melichar by the vertex being regularly narrowed towards the apex, while in *Putala* it is suddenly narrowed before the eyes; the hind margin of the pronotum is obtuse-angularly emarginate, while in the latter it is somewhat rounded; the scutellum is rather flattish, while in *Putala* it is convex. Type *macaonica*.

### *E. macaonica* sp. nov.

In appearance very similar to *Putala maculata* Distant, which apparently belongs to this genus, but differs as follows:

Vertex much shorter, scarcely longer in front of the eyes than the rest of the vertex, and more rounded apically; the radial vein very distinctly forked a little nearer the apex than is the medial vein; otherwise the venation is very similar; tegmina apically more fuscate. Frons much shorter, basal of the eye scarcely longer than a half of the rest; there are three keels (within the lateral keels), one median and two submedian, the latter meeting basally subroundedly.† Coxae and apical third of front tibiae dark piceous.

Length 8 mm. to apex of abdomen, 10 mm. to apex of tegmina.

Hab.: Macao (Muir; also in my collection from Kershaw).

### *Miasa smaragdilinea* (Walker).

Hab.: Borneo, Moewong (Muir). Previously recorded from Tenasserim and Malacca. The examples agree fairly well with Distant's redescription and figure (1906 Faun.Ind.Rh.,III. 248, f.108), except that the frons is unicolorously ochraceous, and the clypeal band, etc., are creamy white. Beneath, the abdomen is orange-brown, the apical margins of the segments narrowly greenish, the lateral margins dark fuscous; the pygophor more or less dark fuscous.

### *Acarna* sp.

Hab.: Borneo, Moewong (Muir). Probably new, but unfortunately I have not seen some of the Stalian descriptions in this genus.

### *Fulgora* Linneus (= *Dictyophora* Germar).

This genus is decidedly heterogeneous and badly in need of revision. *Nersia* Stal is not, as Distant says, synonymous with *Dictyophora* (i. e., *Fulgora*), *bovina* may be taken as its type.

### *F. herbida* (Walker).

Hab.: Mexico; Cuernavaca (Koebele). The two specimens agree very fairly with Walker's description, but not so well with

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† Distant's figure must be faulty, as it shows only two keels within the lateral ones.

Distant's figure in the "Biologia," as the mesonotum is actually greenish; the stigma, moreover, is not represented in the figure and the venation does not quite correspond. For these two specimens, I found the subgenus *Cuernavaca,* separable from *Fulgora* (type *europaea*) as follows:

Vertex scarcely extended before the eyes, the lateral keels meeting roundedly in front; the middle keel visible only near the base. Pronotum very obscurely keeled, anterolateral margins somewhat rounded. The lateral keels of the scutellum are arched outwardly. The frons scarcely extends backwards from the eyes and is somewhat rounded basally; the lateral margins diverge towards the apex, but narrow again just before it; the sublateral keels form an elongate oval, not touching the other margins at any point, the middle keel being percurrent within them. Clypeus feebly carinate. Tegmina much less reticulate; stigma four-celled. As in *Fulgora,* the hind coxae are acutely spined; the hind femora are four-spined; the labium reaches to the hind trochanters.

In the following species the hind margin of the pronotum is minutely, but very distinctly, notched in the middle, whereas in *F. europa* it is notched almost imperceptibly.

### *Fulgora nereides* sp. nov.

Belongs to, or near, the typical subgenus. Head green, the vertex between the lateral keels, the dorsal part of the genae and th middle keel (suffusedly) of the frons, red. Clypeus yellow, the basal half of the keel red. Underside yellowish. Pronotum and scutellum reddish (or sometimes sordid yellowish-green), the keels (suffusedly on pronotum) green. The main veins of the hyaline tegmina are more or less orange-yellow, those on the apical third yellowish-fuscous, the rest greenish. Legs yellowish-red, greenish on coxae and at base of femora; extreme apex of femora, apex of tibiae and apical segment of tarsi, blackish. Vertex not quite so long as the scutellum, ascending a little in front of the eyes at about 45 degrees, the lateral keels arched outwards at first to a little beyond the eyes. thence converging acuminately, so that part of the obliquely-lying genae is clearly visible dorsally; at the extreme apex, a part of the frons is also visible dorsally. The frons is very elongate, the lateral margins strongly narrowed towards the base, and slightly widened at the apical margin; medial and lateral keels of frons and clypeus strong, but the submedian keels of the former are obsolete on the apical half; the lateral keels are not visible, ventrally, at the base itself. The hind femora have five spines; hind tibiae about two and a half times longer than the femora. Antennae small, but larger than in *europaea*, second segment subglobose, apically oblique, the flagellum not arising from the apex.

Length 13 mm. to apex of ab .omen; 17 mm. to apex of tegmina.

Hab.: Amboina (Muir); Borneo, Telok Ayer (Muir).

### *F. glaucides* sp. nov.

Superficially not unlike *F. nereides*, but the head is much less ascendant, and there are eight femoral spines.

Head and prothorax green, rest of the thorax and abdomen more or less yellowish, mostly rather pale. A percurrent stripe from base of pronotum to apex of vertex, another from base of frons to apical margin, another from anterior angle of genae to base of propleura (interrupted by the eye), a sublateral oblique (more obscure) stripe on pronotum, sanguineous. Scutellum more or less suffused with green. Middle keel of clypeus pale sanguineous. Costal vein fuscate, tinged with sanguineous at base; other veins more or less greenish on basal third, shading into tawny on middle third, and into fuscous on apical third, but all a little intermixed. Coxae, femora, and hind tibiae, greenish; fore femora and hind tibiae more or less tinged with brownish on apical half or so (varyingly). Head very little ascendant, about as long as the scutellum, 3½-4 times as long as width between the eyes; lateral margins subparallel to about a little in front of the anterior margin of the eyes, thence acutely converging; the rounded outline of the obliquely lying genae is visible dorsally; also the actual apex is rounded, owing to part of the frons being visible. The frons is very similar to that of *nereides*, except that it is a little less elongate, and more rounded anteriorly, and not so elongate after the disappearance of the genal keels. Apical venation much as in *nereides*. Hind tibiae about 3 times as long as the femora, with eight spines, the five basal small but distinct, the three apical large.

Length 12 mm. to apex of abdomen, 17 mm. to apex of tegmina.

Hab.: Borneo, Telok Ayer (Muir).

### *F. borneides* sp. nov.

Scarcely separable from *F. europaea* by color and pattern. Structurally it may be separated as follows:

Vertex slightly longer, and the lateral margins almost straight, less acute apically; the genal margins as seen dorsally are more arched outwardly. The claval veins unite in the same line as the forking of the brachial, instead of distinctly basal of it; the cells formed by the forking of the main veins are distinctly longer, and the tegmina themselves are much longer; also the apical third is less reticulated. Frons rather longer and narrower, more rounded basally, apical margin very slightly narrower than base of clypeus. Antennae a little more globose.

Length 10 mm. to apex of abdomen, 16 mm. to apex of tegmina.

Hab.: Borneo, Moewong (Muir).

### *Amboina* gen. nov.

Superficially like a long-headed Hasta, but distinguished, from all the old-world *Fulgorini* near the typical genus, by the lack of a stigma, and the *comparatively* long antennae.

The general characters are those of *Hasta*, but it differs as follows: The head anteriorly widens but a little at the apex; it is distinctly narrowed and constricted between the eyes. The eyes are comparatively large and prominent and well rounded exteriorly. The antennae, though short, are yet not of the microscopical size usual in this division, but are distinctly visible from above. The pronotum is much longer medially, being about half the length of the scutellum. The frons is five-carinate, the submedian keels being obsolete between the base of the clypeus and the constriction. The clypeus is very obscurely keeled. The labium reaches the hind trochanters, the third segment being much longer than the fourth. Tegmina more closely reticulated on the apical third, more as in typical *Fulgora;* stigma lacking, but there are about eight suboblique veins on the apical third of the exterior area. The legs are all long and slender, the hind tibiae being more than three times as long as the femora; the latter have five spines, but the basal one is very obscure. Fore femora spineless. Abdomen elongate. Type *moluccana.*

### *A. moluccana* sp. nov.

Male grass green, shading off in parts into pale yellowish-green; metasternum whitish; lateral margins of vertex very narrowly sanguineous. Head nearly twice as long as the pronotum and scutellum.

Length 19-19½ mm.

Hab.: Amboina (Muir).

### *Orodictya* gen. nov.

Differs from *Thanatodictya* as follows: the elongate vertex is not sulcate (the lateral keels being obsolescent) except between the eyes. The disks transversely rugulose, as also beneath and laterally. (The middle keel is apparently only between the eyes as in *Thanatodictya.*) The vertical process is very slightly enlarged at the tip where it is rounded. The five frontal keels are all percurrent. Eyes elongate, not rounded laterally. Hind tibiae with seven to nine spines. Lateral keels of pronotum obsolescent. Apical margin or tegmina broadly multireticulate.

Superficially rather like *Acarna* Stal, but the front is not angulately ampliated; the pronotum is rather deeply emarginate, the fore tibiae are not at all dilated and the hind tibiae are at least quadrispinose apical of the middle.

### *O. monticola* sp. nov.

Pale olivaceous-brown. Keels most greenish (or pale yellowish). Beneath pale yellowish, tinted in parts with greenish or brownish. Fourth segment of labium blackish. Legs very pale greenish, apical one-third of the whole tibiae darker green, basal two-thirds yellowish, apex of hind tibiae and the hind pairs, reddish. Tegmina hyaline, veins dark crimson red (except the green costal). On the apical one-third of tegmen, the crossveins are infuscate, and the apical margin from near the claval apex to the base of the stigma, is broadly (irregularly) reddish ferruginous. The stigma has five or six cells, but is rather confused apically. Wing veins blackish, the apical margin infuscate. Length from tip of head to apex of closed tegmina 22 mill., length of head 5½ mill.

Hab.: Borneo, Moewong (Muir).

## RICANIINAE.

### *Armacia hyalinata* (Donovan).

Hab.: Amboina (Muir). Previously also from New South Wales, Papua, Solomon Islands and Ternate.

### *Ricania speculum* (Walker).

Hab.: Borneo, Pontianak, and Telok Ayer (Muir). Previously also from India, Assam, Ceylon, Burma, Tenasserim, Oriental China, Philippine Islands, and Java. Melichar adds (but perhaps through mistaken synonymy) Waigiu, Flores, Singhapur, Siam and Sumatra.

### *Ricania moluccana* sp. nov.

Sooty; labium and legs yellowish-brown, femora, apices of tibiae, etc., dark fuscous. Abdomen piceous. Tegmina dark smoky, partly with a purplish submetallic glint; a small round purplish metallic spot near the middle of the corium, a series of yellow specks at the end of each costal veinlet as far as the stigma, also a series of smaller byaline specks along the apical margin. Vertex very transverse. Keels of pronotum, scutellum and frons very distinct. Four veins arise from the basal cell, the radial and subradial running parallel. Shape of tegmina much as in *decorata*, but the apical margin rather longer and the hind margin rather shorter in proportion.

Length of body 4 mill.; expanse of tegmina 14 mill.

Hab.: Amboina (Muir).

This appears to belong to *Ricanoptera*, which I can regard only as a subgenus of *Ricania*.

### *Ricania indicata* Melichar.

Hab. Amboina (Muir). Also previously recorded from Ke and Timor Deli.

### *Ricania stigmatica* var. *borneensis* nov.

Hab.: Borneo, Telok Ayer (Muir). It has no white stigmal spot. *R. stigmatica* was recorded from Java.

### *Ricania laratica* sp. nov.

Apparently near *eximia*. Head pitchy brown, vertex and genae partly browner. Pronotum, scutellum, pro- and mesosternum sooty. Tegmina dark smoky, veins blackish, a pale ocellate stigmal spot, and a white wedge-shaped spot on the costal margin near the apex, and another similar one near the apex on the apical margin. A small obscure hyaline speck about the middle. The basal third of the costal margin speckled with yellowish. Abdomen more or less brownish-pitchy. Legs brownish-yellow, more or less dark fuscous on femora and apex of tibiae. The tegmina are sprinkled more or less with greenish-yellow.

Length of body 6 mill.; expanse about 18 mill.

Hab.: Larat (Muir).

The three specimens before me are practically identical. The keels are well marked, the submedian ones on the scutellum being rounded from the apical margin instead of being sinuate, as in *indicata*.

### *Pochazia fuscata* (Fabr.).

Hab.: West Borneo, Telok Ayer (Muir). Previously from India, Burma, Tenasserim, Malay Peninsula, Sumatra, and Java.

### *Sassula dyakana* sp. nov.

This species differs from *sororcula* by the radial vein not being forked; from *osmyloides* by the different venation.

The spotting of the vertex and nota is not unlike that of *sororcula;* the frons has three short, dark, lanceolate lines at the base between the four keels; there is also a dark spot on each side (inside the lateral keels), near the antennae, and another at the apex of each submedian keel just apical of the basal margin; there is no other specking or spotting on the frons, which is distinctly wider and shorter apically of the antennae than in *osmyloides,* and the lateral margins are more sinuate. The costal area is distinctly wider than the subcostal area; there are two spots on the subcostal area near the base. The venation of the corium is very much like that of *sororcula.*

Length 10 mill.; expanse of tegmina 33 mill.

Hab.: Borneo, Telok Ayer (Muir).

### *Gaetulia nigrovenosa* Melichar.

Hab.: Java (Muir). Previously recorded from India, Assam and Tenasserim.

*Nurunderia chrysopoides*= *Gaetulia chrysopoides* Kirkaldy.

Distant has (1909 A. M. N. H. (8) IV.337) erected the genus *Nurunderia* for this species.

### *Mindura obscura* (Fabr.).=*sundana* Kirkaldy.

Hab.: Amboina (Muir). Previously found in Java and South India.

### *Nogodina pallidipennis* (Guérin).

Hab.: Amboina (Muir). Previously also from New South Wales and Vanikoro.

## FLATINAE.

### *Amphiscepa bivittata* (Say).

Hab.: Mexico, Morelos (Koebele). Previously recorded also from Canada and the United States.

### *Amphiscepa immaculata* Kirkaldy.

Hab.: Mexico, Orizaba. Previously from South Arizona.

### *Neomelicharia guttulata* (Stal).

Hab.: Amboina (Muir). Previously known from Buru.

The ground color of the tegmina may be milky or yellowish-green. The anteroapical angle of the tegmina is often black, as also a spot at the apical angle of the clavus and another near base of the same interiorly. The pattern is exceedingly variable. The forms which have milky-white tegmina (this does not appear to be a post-mortem change) may be called var. *lactealis.*

### *Neomelicharia ocellifera* (Walker).

Hab.: Ambonia (Muir). Previously known also from Ceram and Java.

### *Colgar chlorospilus* (Walker).

Hab.: Amboina (Muir), with vars. *decolor,* etc. Previously reported from Papua and Birara.

### *Colgar laraticus* sp. nov.

Green, paler beneath, scutellum yellower. A rather broad stripe from apex of vertex to apex of metanotum, all the margins of the tegmina (except the extreme base of the costal), fore and middle tibiae, the frontal keels very narrowly basally, etc., bright crimson; tegmina otherwise immaculate. Vertex very slightly longer than pronotum, rather more sharply keeled than in the other species of this genus (as also on pronotum and scutellum), thus approaching *Phyllyphanta.* Frons with three keels, much as in *chlorospilus.* Anteroapical angle of tegmina acute, posteroapical angle rectangular, slightly rounded.

Length of body 7 mill.; expanse of tegmina about 18 mill.

Hab.: Larat (Muir).

In immature individuals, the red is replaced by pale orange. It is possible that this is only a var. of *surrecta,* which I do not know.

### *Colgar granulatus* sp. nov.

Very similar to *laraticus,* but the tegmina are distinctly broader, especially basally; the red stripe is absent, only the apex of the head being a little reddish. The red margination of the tegmina is very narrow and obscure. The ground color of the tegmina is yellowish-green, the veins being suffusedly greener, and especially on the apical half being excessively minutely granulated with purplish-brown.

Length of body 8 mill.; expanse of tegmina 20-21 mill.

Hab.: Larat (Muir).

### *Colgar surrectus* (Melichar).

Hab.: Larat (Muir).

### *Phyllyphanta producta* (Spinola).

Hab.: Borneo, Telok Ayer (Muir). Previously known from Sumatra, Banguey, Java, Celebes, and Cochin China.

### *Salurnis kershawi* sp. nov.

Head, pronotum and scutellum pale orange-brown, the disk of the pronotum and of the scutellum pale greenish-yellow, the former with a red-brown stripe down each side of the middle, the latter with an outwardly curved submedian pale brown stripe, meeting apically and basally. A broad fuscous stripe down the middle of the vertex, a fuscous spot at middle of the apical margin of pronotum and of scutellum. Sterna and abdomen pale, the latter more or less yellowish above. Tegmina pale yellowish-green, the veins suffusedly pale fuscous, the commissural margin suffusedly so. Wings milky white. Legs testaceous, tarsi, fore tibiae, etc., pale yellowish-brown. Vertex about half as long as the pronotum, scarcely half as long as the width of the head between the eyes. Anterior margin of pronotum rounded, subtruncate in the middle. Tegmina costally strongly arched, apical angle rounded, posteroapical angle acute, prominent. No sensory granules on corium.

Length of body 7 mill.; expanse of tegmina 19 mill.

Hab.: Macao (Muir; also in my collection from J. C. W. Kershaw).

There are two sublateral, outwardly arched, keels on scutellum, and between these, on each side of the middle, a more obscure one. This species is very similar to *marginellus*, but is yellower, and the vertex distinctly shorter, and the pronotal keels more distant. It seems to lead the way to *Siphanta*.

### *Salurnis marginellus* (Guerin).

Hab.: Borneo, Telok Ayer (Muir). Previously recorded also from India, Tenasserim, Malacca, Cochin China, Shanghai, Kiang-Sin, and Nicobar Islands.

### *Siphanta javana* sp. nov.

This has the characters of *acuta* (Walker), but is distinctly smaller with the anteroapical angle of the tegmina less prominent, and is distinguishable at once by the numerous tubercles on the tegmen. It is smaller than *acutipennis* Kirkaldy and has a distinctly shorter vertex. It is separable from *patruelis*, the other Javan species, by the rounded vertex and narrower frons.

Length 5 mill.; expanse of tegmina about 18 mill.

Hab.: Java, Pekalongan (Muir).

### *Mimophantia maritima* Matsumura.

Hab.: Amboina (Muir). I cannot see any difference of importance between these Moluccan specimens and the descriptions of those from Japan.

### *Phyllodryas* gen. nov.

Vertex very short, its apical margin touching the apical margin of the pronotum in the middle. Frons about as long as wide, lateral margins rounded, acute, reflexed; with a median keel which is not quite percurrent apically. Pronotum not, or very obscurely, carinate. Scutellum with three very obscure keels. Tegmina scarcely twice as long as their middle width, outer fork of the brachial vein joined to the inner fork of the median by two or three short, transverse veins; a regular, transverse, subapical line close to the apical margin, apical angles well rounded. Hind tibiae with one spine. Type *calamantina*.

This genus has some resemblance to *Paratella*, which, however, has no subapical line and has different venation; it differs from *Hilavrita* by the unispinose hind tibiae; from *Petrusa* by the tegmina having one subapical line; and from *Tejasa* by the presence of a number of transverse lines basal of the subapical line. From all these, moreover, it differs by the presence of a few veins in the clavus, but does not come near any of the other genera thus characterized. It has considerable resemblance to *Odyxa truncata?* Distant (not Melichar), but has only one subapical line; Distant figures none, in the supposed Linnean species, but says that it might well be placed in *Cryptoflata,* i. e., *Flata* Fabr., but the latter has more than one subapical line, according to its founder, though not according to Distant, and has two femoral spines.

Melichar's species has evidently, from the description, nothing to do with the supposed Linnean type, the shape of the tegmina alone showing this, and may be renamed *melichari.*

### *Phyllodryas calamina* sp. nov.

Male and female pale greenish or testaceous; tegmina creamy, apical margin (apical of the submarginal line) and the commissural margin in part, pale yellowish fuscous.

Length of body 5 mill.; expanse of tegmina 17 mill.

Hab.: Borneo, Telok Ayer (Muir).

### *Nephesa rosea* (Spinola).

Hab.: Borneo, Telok Ayer (Muir).

### *Nephesa aurora* sp. nov.

Pale brownish-testaceous; apical margin of the second segment of the antennae, third segment of the hind tarsi, etc., fuscous. Tegmina pale rosy, the apical margin and the apical half of the hind margin, pale orange-brown; wings milky. Vertex very short and transverse, the rounded frons partly visible dorsally. Middle keel of pronotum very obscure. Tegmina elongate, apical margin very oblique, apical angles rather prominent, rounded.

Length of the body 12 mill.; expanse of the tegmina 53 mill.; lengths of the fore, apical and hind margins, respectively, of the tegmina, about 25, 13 and 18 mill.

Hab.: Amboina (Muir).

### *Nephesa coromandelica* (Spinola).

Hab.: Borneo, Telok Ayer (Muir). Previously known from Java. The South Indian record is perhaps incorrect.

### *Hansenia kirbyi* Melichar.

Hab.: Borneo, Pontianak (Muir). Previously known from Ceylon. Distant (1906 Faun.Ind.III.411) synonymyzes this with *glauca* (Kirby), apparently incorrectly.

### *Ormenis dolobrata* Fowler.

Hab.: Mexico, Morelos (Koebele).

### *Ormenis plebeia* sp. nov.

This species has the general appearance of *dolobrata,* but differs as follows:

The vertex is distinctly narrower and the eyes smaller; the frons is much less narrowed towards the apex and is scarcely a fourth narrower at the apex than at the base (instead of about one-half); the frontal keels are very obscure, and instead of being truncate, the apical margin of the frons is slightly emarginate. In *dolobrata* the hind margin of the pronotum is obtuse-angulately emarginate; in *plebeia* it is roundly so, and the hind angle of the scutellum is much less elongate and prominent. The pronotum and scutellum are pitchy-brown, the head paler, frontal keels yellowish-brown. In the tegmina the pale spot is much less clear and the apical third is rather more closely reticulate. The clavus is distinctly more strongly granulate. Legs browner.

Lengths of body 6½ mill.; to apex of tegmina 9 mill.

Hab.: Mexico, Cuernavaca (Koebele).

## ISSINAE.

### *Hemisphaerius* Schaum.

This genus is in a very unsatisfactory state, despite the revisions of Butler and Melichar. These revisions have been made practically entirely on color and pattern, which are, judging from the material before me, somewhat variable, certainly rendering invalid Melichar's preliminary divisions of dark and pale forms. At the same time I have made a new species on color and pattern, as I have not the necessary material in other species to form an opinion as to what structures are valuable for specific purposes.

### *Hemisphaerius moluccanus* sp. nov.

Male and female not very shining. Vertex, basal margin of frons, a transverse stripe on the frons at the apical margin, antennae, pronotum, scutellum, legs, etc., ochraceous. Clypeus and rest of frons, genae, and most of the abdomen beneath, dark piceous. Tegmina ochraceous, very closely lined irregularly longitudinally (and shortly furcately) and specked with pale greenish. Vertex more than twice as wide as its length, not longer (scarcely as long) than an eye, with two pits.

Length to apex of tegmina 4 mill.

Hab.: Amboina (Muir).

### *Hemisphaerius javensis* Melichar.

Hab.: Larat (Muir). Previously recorded from Java. One example is suffused with rosy. This species also varies as follows. The tegmina from uniform pale green to piceous, there being intermediate forms. The frons from immaculate green to blackish with a pale green transverse stripe at the apical margin.

The nymph is like the adult, except that the hind tibiae are rather dilated; the clypeus is pale green.

The nymph has a double row of oblique granules on the pronotum, the apical the longer. The large development of the tegmina makes the hopper very wide. The hind tibiae are flattened and widened and have one median spine.

The coloring is pale greenish, yellower on head and pronotum, the urotergites very closely specked with brown. Legs brownish-yellow, femora more or less infuscate. Sternopleurites mostly fuscate.

### *Hemisphaerius tristis* Stal var. *lineatalis* nov.

Hab.: Amboina (Muir). The type was from Batchian.

This agrees with the description of *tristis*, as far as it goes, except that the pronotum is almost entirely ochraceous (this varies somewhat), and there is a generally percurrent ochraceous line down the scutellum.

### *Gelastissus albolineatus* Kirkaldy.

Hab.: Amboina. Previously from Queensland.

### *G. histrionicus* Kirkaldy.

Hab.: Amboina. Previously from Queensland.
*G. suffusus* Kirkaldy is merely a variety of this; one of the Amboina specimens has the apical parts of the tegmina piceous.

### *Lollius furcifer* Stal.

Hab.: Amboina (Muir). Previously from Timor, Batchian, Ke, Solomons, Fiji, and the Nicobars.

### *Thaebena stali,* Melichar.

The type of this genus, which Melichar could not trace, was fixed by Stal as *retractus* (Walker). The present species differs from that, by the frons being much longer than broad, while the head pronotum, frons, etc., are the same color, viz., reddish-ochreous. From *T. stali* Melichar (typical) it differs only by the lateral margin of the vertex diverging emarginately, roundly, towards the base which is wider than the apical margin. It is slightly wider at base than long.
Hab.: Borneo, Moewong (Muir). Previously from Singapore.

### *Capelopterum bimaculatum* Melichar.

Hab.: Amboina (Muir). Papua.

### *Aphelonema vespertina* sp. nov.

Allied to *A. rugosa* (Ball), but the clypeus has no pale median line, and the vertex proper is roundly triangular.

Pale yellowish-testaceous, lateral margins of the vertex proper, of the pronotum, and of the flat part of the scutellum, pale piceous, the sloping sides of the scutellum dark piceous. Frons slightly clouded with fuscous on its flat disk, outside the circular keel it is almost entirely dark piceous, as also are the genae between the eyes and antennae, and clypeus (except at extreme base). Tegmina pale, laterally indefinitely pale fuscous, venation white. Urotergites medially pale olivaceous, a very narrow white undulating line separating this from the dark piceous hue which suffuses most of the lateral part, especially towards the middle. The median part might be flecked with pale purplish-red. Beneath dark piceous with a few irregular yellow spots; coxae mostly dark piceous; tibiae with dark piceous bands, etc.; antennae black. The pustules are pale and well marked on the frons outside the circular keel, and on the pronotum, scutellum, and urotergites laterally. The vertex is as long as the pronotum, and is roundly triangular, the parts of the frons outside the circular keel being thus visible from above. Tegmina are formed much like those of *rugosa*. The outer keels of the frons form a circle, which does not touch the clypeus, but touches the vertex.

Length 3.5 mill.

Hab.: Mexico, Chapultepec (Koebele).

### *Bruchomorpha dorsata* Fitch.

Hab.: Mexico, Morelos, Cuernavaca (Koebele). Previously recorded from all over the United States.

The nymphs have very much the same form and coloring, except that the face is declivous.

### *Bruchomorpha mexicana* sp. nov.

Pale yellowish-cinereous; vertex with four not perfectly defined blackish spots; frons pustulate, irregularly, blackish outside the oval keel, and of the same suffusion laterally and basally inside it; Genae mostly blackish; hind margin pale; pronotum very thickly pustulate and slightly clouded. Disk of scutellum slightly fuscous towards the hind angle; oblique sides thickly pustulate and more or less blackish-brown. Tegmina pale brownish-olivaceous, veinings pale. Urotergites thickly blotched and spotted with blackish-brown. Sterna pale brownish-yellow, most of the ambulacra of the middle legs black. Urosternites pale brownish-yellow, laterally blackish, this almost meeting basally. Legs pale brownish-yellow, irregularly marked with dark fuscous. Labium the same ground color, extreme apex dark.

The frontal keels are very strongly marked, the curved keels forming an oval, truncate basally, and roundly acute apically, the whole not so elongate apically as in *dorsata*. The frons is almost horizontal to the vertex; and the clypeus is apically horizontal to the frons, which is about one-half longer than its basal width. The tegmina are formed much as in *pallidipes*.

Length of female 3 mill., breadth 1.75 mill.

Hab.: Mexico, Cuernavaca (Koebele). Very different to any other *Bruchomorpha*.

### *Hysteropterum montezuma* sp. nov.

Differs from *H. montanum* by the much shorter vertex, the angulate (or at least medially deflected) clypeus, the color, etc.

Testaceous, irregularly and obscurely, clouded more darkly. On the frons there are two transverse, obscurely indicated, pale bands, the rest minutely and thickly speckled. Tegmina greyish-testaceous, a broad blackish wedge from hind angle of scutellum to near the costal margin, as the base, the third angle about the middle of the tegmen a little inward; the two third angles (on each tegmen) are joined by an obscurely indicated dark. sinuate, transverse bands. The rest of the tegmen is closely specked more darkly. Abdomen and legs yellowish-testaceous, irregularly marked with black. Although the vertex is short, yet the frons is distinctly longer than wide, and there is a median percurrent keel which thickens in the clypeus. Pronotum nearly twice as long as the head. Scutellum rather obscurely tricarinate.

Length 4.25 mill.; breadth 2.8 mill.

Hab.: Mexico, Cuernavaca and Yantepec (Koebele).

# PART II.

By F. Muir.

## DERBIDAE.

## INTRODUCTION.

### HABITS.

The species described in this Bulletin (except a few specially indicated) were collected during the time I was in Fiji and the Malay Archipelago, investigating insects injurious to sugar-cane.

Many species of this family are to be found in great numbers on sugar-cane, but only in the adult stage; the young and eggs I have never found on this host-plant. I am not acquainted with any record of the life-history of any species of this family, and I have never come across the eggs, but I have taken the nymphs of several species, all having similar facies and habitat. All these nymphs were living in rotten tree trunks, were dark in color, flattened horizontally, with wide faces, even in such forms as *Zoraida;* both in appearance and habitat they are similar to many species of *Oliarus,* but the females do not possess the large wax-plate at the end of the abdomen. Although the adults of some species collect in such numbers in cane fields, where they are very conspicuous on account of the habit they have of often sitting near together, in Indian-file, with their long wings over their backs, yet they never do any considerable damage; this must be attributed to the habit of the young of not feeding on sugar cane, for if they did their number, which is much greater than that of the adults, would cause considerable damage.

Another strange feature of these swarms of Derbidae is that they generally consist of only one sex and at such times it is very difficult to find the opposite sex.

That this interesting family of leaf-hoppers has been greatly neglected is shown by the fact that we know so little about their life histories and that I, although only collecting them incidentally, have been able to add 16 genera and 96 species to it. My collection is by no means representative as, confined to the cultivated areas by my special work, I collected but little in the natural forest where these forms are most numerous and diversified.

None of this family exists in the Hawaiian Islands, and even if one or more species should ever become established here, the fact of the young living in rotten timber would confine them to very limited areas.

## CLASSIFICATION.

Among the characters which Stal ascribes to this family, the short, or very short, apical segment of labium is the most distinctive. *Nisia, Suva* and *Phaconeura* all possess a long apical labial segment; many of the species of these genera also possess a median facial ocellus and a large wax plate at the end of the female abdomen, characters which belong to the *Cixiinae;* the neuration of their tegmina is also very different from any Derbid. For these reasons I exclude them from the family *Derbidae*, but, inconsistently, have included them in this Bulletin because several of our greatest authorities on Homoptera have considered them as Derbids. There is no doubt that *Kermesia* is closely allied to these three genera and will also have to be removed from the *Derbidae*, although, according to Distant, it has a minute apical joint to the labium.

I have used the neuration of the tegmina for dividing the family into groups, and again for redividing the groups; it thus becomes necessary to use a more definite nomenclature than is usual with many workers in Homoptera. The terminology of Comstock and Needham has been employed as it is the one that is most generally known. To make sure of the different systems of nerves I have followed the development of the tracheal system in the tegmina of the nymph of several groups of Homoptera. The contention that without studying the development it is sometimes difficult, or impossible, to decide to which group the vein belongs, is no argument against the use of this system, as the same disadvantage is attached to any system. When we do know the development of a greater number of forms, I believe we shall be able to divide the Fulgoroidea into better defined and more numerous families. I have not used the neuration of the wings, as in so many forms they are so covered with waxy secretions that only by taking them off and cleaning them can the neuration be seen with any certainty, an operation that many workers would not perform with many of the small, delicate species, which are at present so rare in collections. Next to the tegmina the head and thorax present the best characters. In many forms there is a well-developed process below the antenna, *the subantennal process*, either in the form of a deep keel or plate, or a more or less spatulate organ. The best character on the pronotum is the absence or presence of the "shoulder keel"; this is a large carina, or flange, running from the anterior margin behind the eyes to the hind margin, with which it often amalgamates, forming, together with the lateral edges, which are sometimes curled forward, a "post-antennal chamber." The shortness of the pronotum is oftimes more apparent than real, on account of the median portion standing nearly perpendicular, being bent in the middle and fitted into the emargination of the vertex. The absence or presence of carinae on pronotum or scutellum is a very uncertain character, as many small light-colored species appear to have carinae on account of the three dark longitudinal marks, indicating the attachment of the thoracic muscles.

For specific distinction it is necessary to compare the genital armature in certain groups. The present study shows that very few species have a wide distribution among the Malay Islands, but certain of the species are difficult to separate except by the genitalia.

The family can be divided into four groups:

1. Tegmina exceptionally long and narrow, wings less than half the length of tegmina, sometimes very minute. .Group III
   Tegmina not long and narrow, wings more than half the length of tegmina. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .2
2. Cubital veins not reaching to hind margin of tegmen, but ending in the extended claval vein; third claval cell open, extending along hind margin to last apical median cell. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .Group II
   Cubital veins ending in hind margin of tegmen, third claval cell closed, not extending to last apical median cell. . . . . .3
3. Cubitus simple or furcate, not running into first median sector . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .Group I
   Cubitus with three or more branches (or the cubitus connected with the first median sector, forming an angular or diamond-shape cell) . . . . . . . . . . . . . . . . . . . . . .Group IV

The first, or *Cenchrea,* group is a natural one, and the forms included in it are closely allied; in many of the genera the systems of neuration are all separated from the base of the tegmina, such forms being the most generalized of the *Derbidae*. *Phaciocephalus miltodias* and *P. pullatus* are of interest as showing the commencement of the modification which distinguishes group two, namely, the opening of the third claval cell and the failure of the cubital veins to directly reach the posterior margin. (Pl. I f. 22, Pl. III f. 16.)

The second, or *Otiocerus,* group is also a homogeneous one and follows naturally after group one; it contains some of the most fantistically shaped insects of the family, such as *Swezeyia* with its bizarre shaped head, and *Megatropis*, with its wonderful, separate head-keels.

The third group is distinctly divided into two subgroups, the relationship between them being very indistinct and uncertain. The *Sikiana* subgroup consists of delicate little creatures, with wings apparently wholly devoted to sound production; the *Zoraida* subgroup also has very small wings with large anal areas, devoted to sound production, but never so greatly reduced as in the *Sikiana* section. It is among the *Zoraida* section that the most conspicuous forms of the family are to be found, and from whence the forms generally chosen to illustrate the family are taken. Among the genera of this section *Zeugma* stands apart as possessing both shoulder keels and subantennal processes and demonstrates the uselessness of the structure of head and thorax for primary divisions. *Diostrombus* and *Comma* are the two forms which approach nearest to the *Sikiana* section.

The last group is not a natural one; it consists of *Derbe* and *Mysidia*, which approach the *Zoraida* section of group three, the *Rhotana* section, which is somewhat aberrant, and the Nisian genera, which are not true Derbids. There is a touch of irony in the fact that *Derbe*, the type genus of the family, is not truly characteristic of any of the main groups. By discarding *Nisia* and its allies, and placing *Derbe* and *Mysidia* in the *Zoraida* group, the small *Rhotana* group could remain unattached.

Unfortunately there are certain genera of which the descriptions are not complete enough to enable me to include them in my tables. Working in a place away from large collections and libraries, one is dependent upon one's friends more fortunately situated. My thanks are due to the United States National Museum for sending me specimens for examination, and to Mr. W. L. Distant of the British Museum, for specimens, answers to many questions and much valuable information.

Roban and Pekalongan are in Java, Telok Ayer, Pontianak and Mowong in Borneo, and Laloki in British New Guinea.

When working with small and delicate insects like this family I use a Greenough binocular, as a single hand-lens is not suitable to recognize carinae, etc.

The measurements are from front of head to end of pygophor, not including the genital styles, and from base to apex of one tegmen.

### GROUP I.

1. Subcosta and radia separate from near base of tegmen (subcostal cell long) .................................. 2
Subcosta and radia contiguous to middle or beyond middle of tegmen (subcostal cell short) ...................... 8
2. Subantennal process absent or very small .............. 3
Subantennal process well developed .................. 7
3. Shoulder keels absent, or only slightly developed ....... 4
Shoulder keels well developed ........................ 5
4. In profile face and vertex angular; lateral keels of face not contiguous ........................ *Goneokara*
In profile face and vertex rounded; lateral keels of face contiguous to near apex .................. *Cyclokara*
5. Vertex wide, length subequal to width of base ......... 6
Vertex narrow, much longer than wide.... *Basileocephalus*
6. Face with central, longitudinal keel............. *Syntames*
Face without central longitudinal keel...... *Phaciocephalus*
7. Face distinctly centrally keeled............... *Eocenchrea*
Face not centrally keeled...................... *Cedusa*
8. Media forking from radia one-third from base of tegmen .................. **Cenchrea*, **Herpis?* **Persis?*
Media and radia separate from very near base.......... 9
9. Subantennal process present.........................10
Subantenal process absent ..........................11
10. Vertex and face in profile forming a curve..*Cyclometopum*
In profile head angular at junction of face and vertex... ............................**Lamenia*, *Thyrocephalus*
11. Vertex and face narrow, subparallel, apex of face narrower than base of clypeus.................. **Dawnaria*
Vertex about as broad as long, apex of face as wide as base of clypeus ..................................12
12. Clypeus triangular, medianally and laterally keeled...... ........................................... *Vekunta*
Clypeus moderately convex and centrally keeled........ ....................................... **Parandenina*

### *Goneokara* gen. nov.

Type, *pullum*.

Pronotum wider than head. Vertex wider at base than long, base with fine keel, obtusely angularly emarginate; narrowing evenly but slightly to the truncate apex; sides very broadly keeled, studded with wax pits; face and vertex distinctly separated by transverse keel; face slightly narrowed in middle, widening at base, sides deeply keeled, keels with wax pits; clypeus flattened, tricarinate, the lateral ones joining the facial keels; a very small subantennal process; male antennae with second joint globular, a little longer than wide, slightly enlarged toward apex, female antenna smaller and not so globular; pronotum short, broadly angularly emarginate behind, shoulder keels very small; scutellum longer than broad, tricarinate, the lateral carinae fading out on basal half; tegmina fairly short and broad, neuration near to *Cedusa;* granulate on first claval vein and costa. The head and thorax of this is as in *Vekunta*, but the tegmina is very different.

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* Indicates in this and the following tables that I have not seen specimens of the genus.

### (1) *G. pullum* sp. nov. (♂ ♀).

Pls. I fig. 21 and II fig. 6.

Vertex, abdomen and notum fuscous brown, face, clypeus, rostrum, legs, and ventral side of thorax lighter brown; tegmina fuscous brown, a small yellowish-white stripe across the apex of costal cell, tips of apical veins whitish; wings fuscous, dark-veined.

Length of body 3 mm.; tegmen 4 mm.

Habitat, Telok Ayer.

## *Cyclokara* gen. nov.

Type, *C. girdlestoni*.

In profile vertex and face forming continuous curve, eyes large, round, slightly emarginate below, antennae small, cylindrical, not reaching to edge of gena, about twice as long as broad; no subantennal process. Vertex small, acutely triangular, base angularly emarginate and keeled, laterally finely keeled; face very narrow, slightly broadening apically below eyes, sides finely keeled, keels contiguous to near apex; clypeus tricarinate; pronotum of medium length, broadly and roundly emarginate behind, medianly keeled, shoulder keels nearly obsolete, a fine transverse carina from middle to the posterior end of shoulder keel; scutellum tricarinate, broader than long, rounded anteriorly, lateral angles behind middle, posterior margin subangular; apex of hind tibae with one large spine on outer and a group or four to five spines on inner side. Tegmina long, apically pointed, second cubitus vein branched, first median sector arising well beyond middle, costa distinctly granulated along basal third. The shape and neuration of this tegmina distinguishes this genus; it comes into the *Basileocephalus* group.

### (1) *girdlestoni* (♂) sp. nov.

Pls. II fig. 13, III fig. 4.

Head, thorax, and legs yellowish tinged with red, abdomen red, brightest above, with a black mark in middle of dorsum; genital styles yellow on basal third, black on apical two-thirds; tegmina fuscous, red-veined, a black mark over base of radio-apical and first three medio-apical cells; wings uniformly fuscous, red-veined.

Length, body 2 mm., tegmen 4.5 mm.

Habitat: Mowong. I take the pleasure of naming this little insect after Mr. L. Girdlestone, to whom I am indebted for many kindnesses during my stay at his house at Mowong.

### (2) *fulvum* (♂) sp. nov.

Head, thorax, legs, and abdomen dirty yellow, a small black triangular mark on dorsum and a small black dot on each side of abdomen, genital styles pale yellow, eyes deep chocolate brown; tegmina hyaline, opaque with waxy secretion, yellow-veined, irregularly marked with fuscous at base of subcostal cell, continuing over apex of radial cell to hind margin and to apex, all apical cells more or less fuscous, being darkest on the cross-veins from subcostal to third radial vein; wings fuscous, dark-veined.

Length of body 2.2 mm.; tegmen 4.5 mm.

Habitat: Mowong.

## *Phaciocephalus* Kirk.

### (1) *flavocollaris* sp. nov. (♂).

Differs from *vitiensis* by its slightly shorter pronotum and less pronounced scutegial carinae. Head, pronotum, tegulae, and legs reddish-yellow; scutellum and the sides of abdomen tinged with red, anal tube fuscous, genital armature yellowish, last tarsus and labial joint fuscous; tegmina fuscous brown, darker at base, veins slightly darkened, a dirty white, transparent spot on costal border at end of costal cell.

Length, body 3.5 mm.; tegmen 5 mm.

Habitat: Tuloc Ayer.

### (2) *rattlei* sp. nov (♂ ♀).

Vertex a little longer than type; tegmina as in *pullatus*. Head, body, thorax, legs, and tegmina yellow inclined to salmon; posterior half of tegmina, including clavus, more distinctly salmon, a small fuscous mark at end of subcosta, with a reddish mark behind it, the fuscous mark sometimes running into the salmon-colored streak, making it fuscous; wings white and white-veined. Lateral edges of genital claspers subparallel to near tip, where it becomes spatulate and rounded.

Length, body 4 mm.; tegmen 6 mm.

Habitat: Laloki.

I take the pleasure of naming this pretty little insect after Mr. F. Rattle, with whom I lived during my two visits to the Laloki district of Papua.

### (3) *concolor* sp. nov. (♂).

Vertex and tegmen as in *pullatus.* Like the proceeding, but uniformly light reddish-yellow. Besides the absence of the color on the inner half of the tegmen, the male genital claspers separate this species, being longer, widest about one-third from base, where it is produced into an obtuse point on upper edge, and then narrowed to a fine, upward-turned point at the apex.

Length of body 4 mm.; tegmen 6 mm.

Habitat: Laloki.

### (4) *funebris* sp. nov. (♂ ♀).

Vertex perceptibly shorter than wide; tegmen peculiar in having the first medial sector forked from near its base. Dorsal aspect dark fuscous brown, ventral aspect and legs yellowish-brown; tegmina and wings fuscous, dark-veined. The whole insect, including wings and tegmina, generally covered with flocculent waxy secretion. Genital claspers short, produced into curved, pointed process on upper distal corner, and into a short round process on lower distal corner.

Length of body 3.7 mm.; tegmen 6 mm.

Habitat: Larat.

### *Cedusa,* Fowler.

Biol. Centr. Amer. Rhyn., vol. I, p. 112, Pl. 11, Fig. 28.

(1) *C. funesta* (type), Fowler, t. c. p. 112.

(2) *C. venosa,* Fowler, t. c. p. 112.

(3) *C. vulgaris* (Fitch).

*Poeciloptera vulgaris.* Fitch. 1857, Cat. N. Y. Insects.
*Lamenia vulgaris.* Uhler 1884 and others.

### (4) *C. kulia* (Kirk).

*Lamenia kulia,* Kirk., H. S. P. A. Ent. Bull. 1, p. 400. This species has the face wider at apex than in *vulgaris.*

### (5) *C. borneensis* sp. nov. (♂).

Light brown, inclining to yellow on ventral side. Tips of rostrum fuscous; dorsum of abdomen dark brown; eye castaneous; tegmina yellowish, slightly fuscous over apical half, veins slightly darker; wings light yellowish with slightly darker veins. Ventral edge of pygophor truncate, lateral edges slightly convexly curved; and segment about twice as long as broad, parallel sided, rounded at apex, anus on basal third; styles subquadrate, ventral edge slightly convexly curved, apical edge turned slightly inward, a strong inwardly curved spine on dorsal apical corner.

Length 2 mm.; tegmen 3.5.

Habitat: Teloc Ayer.

This species agrees in neuration and structure of head with *C. kulia,* the only other species at present known from the Malays.

Stal figured his type of *Lamenia* on Plate IV of "Eugenies Resa" in a very careful manner; the neuration is quite distinct and plainly shows that the subcosta and radia are joined, and that the vertex is longer than broad. It is very near to *Thyrocephalus,* Kirk., but until I can examine *L. caliginea* I keep them distinct. *L. vulgaris* can be placed in *Cedusa,* the other American forms I have not examined, *L. kulia* also belongs to this genus.

I am not acquainted with *Herpis,* which Stal synonymized with *Lamenia.* It is possible that it does not agree with my restricted *Lamenia* but with *Cedusa,* in which case these forms will have to be placed under *Herpis.*

### *Eocenchrea* gen. nov.

Type *E. maorica* Kirk.

In profile vertex and face gradually curved, very slight angulation at junction of vertex and face. Vertex about half as long as broad, base and apex nearly truncate, slightly narrowed at apex, excavate in middle, transverse keel separating vertex from face; face laterally angulate and broadest about one-fourth from apex, then narrowing to apex, lateral keels deep, distinct median carina; large subantennal process from angle of face to back of gena; antennae oval, small; lateral ocellus beneath eye; clypeus large, flattened, tricarinate, lateral carinae large; pronotum short, shoulder keels very small; scutellum as long as broad, lateral angles about middle, indistinctly tricarinate, especially the lateral ones. Tegmen with long subcostal cell, four median sectors, the first furcate.

*Cencharea dorsalis,* West., has a very short subcostal cell and the media arises from the radia about one-third from the base of the tegmina; the figure of this species also shows an antennal chamber formed by the pronotum (shoulder keels being large and the subantennal process absent); therefore *maorica* cannot be included with *dorsalis*. *Lamenia hiva* Kirk. agrees with *maorica*, but the facial keels are not so deep. The presence of the median facial keel also divides this genus from *Cenchre*a or *Lamenia.*

(1) *Eocenchrea maorica* (Kirk.).

*Cenchrea maorica* Kirk. Proc. Haw. Ent. Soc. II. 2. p. 80.

(2) *Eocenchrea hiva* Kirk.

*Lamenia hiva* Kirk. H. S. P. A. Ent. Bull. I. p. 404.

*Vekunta.* Dist.

*Temesa,* Melich. Hom. Faun. Ceylon. p. 40 Nom. praeocc.
*Vekunta,* Dist. Faun. Brit. Ind. Rhyn. III p. 287. n. nom.*

This genus was placed by Melichar among the Cixiidae, but was considered by Kirkaldy to be a Derbid. My two species, which conform to Melichar's generic characters and have a similar tegminal neuration, possess a short apical labial joint. The absence of a distinct subantennal process separates this genus from *Thyrocephalus.*

(1) *hyalina* sp. nov. (♂).

Pl. I fig. 7.

Pale yellow; lateral third of scutellum fuscous, darkest on hind margins; dorsum of abdomen fuscous; a round black spot on mesopleura, another on metapleura; tegmina hyaline, tinged with light fuscous-yellow on distal half; dark fuscous over costa, along hind margin a narrow mark from radial cross-vein to apex, apical edge and veins fuscous; wings hyaline, light-veined. Genital style narrow for basal third, then roundly widened to near the truncate apex; one-third from base there is a short thick bilobed process, with small hooks on the lobes and near base, also a small curved spine a little way beyond this process.

Length of body 3.3 mm.; tegmen 4.4 mm.

Habitat: Java.

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* In Mr. Distant's description of this genus I think "face" in the first line should read "vertex" and "vertex" in the fourth line "face."

### (3) *badia* sp. nov. ( ♂ ♀ ).

Face slightly wider than in *hyalina* and keels not so deep. Dark brown, inclining to black on dorsum; legs, rostrum and antennae yellowish, except the last tarsal and labial joints, which are dark; tegmina dark brown, a small yellowish patch at end of costal cell, reaching from costa to media, with a dark spot in the middle of it; wings brown, dark-veined.

Length of body 2.4 mm.; tegmen 3.8 mm.

## *Lamenia* Stal.

Eugenies Resa, p. 277. Pl. IV fig. 5-5b.

Type *Delphax caliginea* Stal. Öfv. af. K. Vet- Ak. Förh. 1854, p. 246.

Habitat: Taiti.

For reasons stated under *Cedusa,* I have separated this species from such forms as *Lamenia vulgaris*. I consider it likely that *Thyrocephalus* Kirk. will eventually be sunk into this genus.

## *Thyrocephalus* Kirk.

H. S. P. A. Ent. Bull. I. 429. Bull. III 169, text fig. 2.

The type of this genus (*leucopterus*), owing to a defective specimen, was characterized as having a 5-carinate scutellum and so illustrated; it has only a central carina. The tegmen figured in Bull. III has the first cubitus vein abnormally approaching the media (media-cross vein very small), another specimen has it absolutely touching. This genus is near to Stal's *Lamenia* and may be eventually synonymized therewith.

### (1) *T. flavo-monile* sp. nov. ( ♂ ♀ ).

Pronotum, head, legs and ventral side of thorax and abdomen yellow, scutellum dark brown, distal portion of facial keels, clypeus, mark on metapleura, anterior and middle tibiae and upper portion of obdomen fuscous; tegmina hyaline, slightly opaque, brown veined, the brown spreading out broad toward base of veins, filling most of the clavus; wings hyaline, brown-veined. Tegmina, wings and body covered with white flocculent waxy secretion. Genital style with fairly long, pointed and curved apex; anal segment narrowly rounded at apex.

Length of body 4.6 mm.; tegmen 4.7 mm.

Habitat: Amboina, Ceram, and Larat.

The nymph of this species has a broad face, the sides outwardly curved, narrowest at apex and base, a wide area, about a fourth, along each side being beset with wax pits.

### (2) *T. flavo-maculatus* sp. nov. (♂ ♀).

Pl. I fig. 1.

Head, thorax, abdomen and tegmina black or brownish black; legs yellowish, last tarsal and labial joint and two bands on front tibiae fuscous; a yellow spot tinged with red on costa at end of costal cell, wings fuscous, dark-veined; base of tegmina and wings reddish; genial style long, narrow, curved at tip and pointed, apex of anal tube sharply pointed, sides of pygophor produced into a curved point.

Length of body 3 mm.; tegmen 4.6 mm.

Habitat: Laloki.

### (3) *T. laratensis* sp. nov. (♂).

Pl. I fig. 3.

Similar to *flavomaculatus,* but yellow spot on tegmina smaller. The genitalia shows that this is quite distinct from *flavomaculatus;* the genital style is longer, thinner and more curved at apex; the anal segment bluntly rounded at apex and the side of the pygophor bluntly produced.

Length of body 2.6 mm.: tegmen 4 mm.

Habitat: Larat.

### (4) *T. pseudolaratensis* sp. nov. (♂).

Pl. I figs. 2, 24.

This species is like *laratensis* except for the genitalia, the apex of anal tube being emarginate and the apex of genital style thin and curved.

Length of body 2.8 mm.; tegmen 4.3 mm.

Habitat: Amboina.

### (5) *T. croceus* sp. nov. (♂).

Saffron color; pronotum, vertex and tegulae lighter than scutellum; legs lighter than body; last tarsal joint and apex of tibia blackish; face (especially the keels) and dorsus of abdomen fuscous; eyes dark brown; tegmina hyaline, veins pale yellow, the whole thickly covered with waxy secretions, making it opaquely white, subcostal and first and second medial apical cells fuscous; wings white, light veined. Anal tube flattened toward apex, curved downward and emarginate at apex, sides of pygophor obtusely angularly produced, the apex pointed; genital styles straight along lower edge, pointed at apex which is outwardly curved, a spine-like process situated on inner side near base.

Length of body 3.6 mm.; tegmen 4.8 mm.

Habitat: Teloc Ayer.

### (6) *T. fuscorostratus* sp. nov. (♂ ♀).

Vertex slightly shorter than in *croceus*, making angle between face and vertex slightly greater; keels on face not so large. Head and thorax dark yellow, facial keels, front of clypeus, margin of tegulae, last labial joint fuscous; abdomen dorsally dark, ventrally light; tegmina hyaline, yellowish, a long triangular fuscous mark in second radial and radio-apical cells, the distal portion of last medial and two cubital veins fuscous, slightly fucous on base of costa and along claval veins; wings slightly fuscous, dark veined. This species is near *croceus*, but the genitalia is distinct, the genital claspers being slightly narrower and the apex of anal segment rounded, with a large downward pointing spine on each side near apex.

Length of abdomen 3 mm.; tegmen 4.6 mm.

Habitat: Telok Ayer.

### (7) *T. vitreus* sp. nov. (♂).

Facial keels fairly deep, perceptibly converging about middle. Light yellow, facial keels, dorsum of abdomen and last labial joint fuscous; a round black spot on metapleura; tegmina vitreous, claval and distal ends of cubital veins smoky; wings smoky vitreous, dark-veined. Anal segment rounded at apex; genital styles slightly spatulate at end, rounded at apex.

Length of body 2.5 mm.; tegmen 3.8 mm.

Habitat: Roban, Java.

### (8) *T. pseudotypicus* sp. nov. (♂).

Pl. I fig. 5.

Head, pronotum, legs and abdomen testaceous, face (especially keels) fuscous; abdomen dorsally blackish; tegmina hyaline, opaquely white through waxy secretion, a fuscous mark in apical subcostal and first apical median cells. This species is very close to the type of the genus (*leucopterus*), but the genitalia is very distinct. A genital style of each is figured as that is the more easily observed part of this structure, but the penis presents more marked differences.

Length of body 3 mm.; tegmina 4 mm.

Habitat: Teloc Ayer.

### (9) *T. obscurus* sp. nov. (♂).

Pl. I fig. 6.

Only by the genitalia am I able to distinguish this species from *leucopterus* with any certainty. The anal tube is pointed at apex, the genital clasper is figured.

Length of body 2.5 mm.; tegmen 3.5 mm.

Habitat: Teloc Ayer.

### (10) *T. fullawayi* sp. nov. (♂).

Brown; keels of face and vertex and subantennal process lighter brown, antennae, borders of pronotum, legs (except front and middle coxae, which are brown) and metasterna yellow, front and apices of middle tibiae fuscous, pleurae of abdomen yellowish, hind margins of abdominal segments reddish; tegmina brown, costal border and a large spot at end of costa yellow; wings fuscous brown with dark veins; both tegmina and wings more or less covered with white waxy secretion.

Male pygophor truncate on ventral edge, slightly and roundly produced at sides; length of anal segment slightly more than twice the breadth, anus slightly before middle. Widest slightly beyond anus, narrowing to the rounded apex, lateral edges on basal half turned down, roundly produced about middle. Genital styles long and narrow, reaching beyond end of anal segment, apex turned inward and upward, ending in a fine spine; upper edge straight, lower edge straight to near curve where there is a small angular projection; two small projections on inner side near base.

Length 2.7 mm.; tegmen 4.4 mm.

Hab.: Island of Guam. Mr. D. T. Fullaway's collection, no. 1219.

This comes nearest to *laratensis*, but is easily distinguished by the styles being narrower and not drawn out into such long spines at apices and the sides rounded and not so much produced, also by the downward-turned lateral edges of the anal segment being larger.

### *Cyclometopum* gen. nov.

Type *amboinense*.

Vertex and face in profile forming a continuous curve; subantennal process large, circular, attached to gena beneath the antenna; antennae subovate, not reaching to middle of eye; lateral ocelli present; vertex slightly broader at base than long, slightly narrowed at apex, base widely angularly emarginate, with narrow keel, sides with broad keels beset with wax pits; transverse keel dividing face from vertex; face subparallel with large lateral keels beset with wax pits on inner side; clypeus broad at base, tricarinate, lateral carinae very distinct, wider apart at base than keels of face. Pronotum short, widely angularly emarginate behind, shoulder keels very small; scutellum as long as broad, lateral angles about middle, distinctly tricarinate. Tegmina very near to *Thyrocephalus*, the radial cross-vein very short, media with two sectors, cubitus furcate.

This genus is separated from *Thyrocephalus* by the rounded profile of the head and the circular subantennal process.

### (1) *C. amboinense* (♂) sp. nov.

Pls. I fig. 25, II fig. 12.

Shiny black, the tip of clypeus, labium and legs yellowish.

Tegmina and wings black, a minute red spot at end of subcostal cell.

Ventral edge of pygophor truncate, lateral edges sinuous, anal segment about three times the length of the width of base, anus a little beyond middle, in profile it is swollen, apex angularly emarginate forming two downward-pointing points; styles long, narrow, subparallel sided, reaching to end of anal segment, dorsal edge slightly curved, ventral edge with small rounded projection about a third from apex, apex forming an inwardly turned point.

Length 2.8 mm.; tegmen 3.6 mm.

Habitat: Amboina.

## GROUP II.

1. Media not arising from radia, or arising before forking of subcosta and radia.......................... 2
   Media not separating from radia until after forking of subcosta and radia...............................28
2. First median sector arising before apical third of tegmen.. 3
   Median sectors confined to apical third or tegmen, first cubitus often joining second, enclosing second cubital cell‡ .........................................22
3. Forking of subcosta and radia at or before the middle of tegmen (subcostal cell long)....................... 4
   Forking of subcosta and radia beyond the middle of tegmen (subcostal cell short).........................19

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‡ In *Robigus* the first median sector is before the apical third, but it comes into this group.

4. Antennae with first joint well developed and flattened.......... *Patara**
Antennae with first joint very small.......... 5

5. Antennae pectinated .......... *Devadanda**
Antennae not pectinated .......... 6

6. Genae without subantennal processes.......... 7
Genae with subantennal processes .......... 13

7. Vertex extending well beyond eyes, in profile more or less angular between vertex and face.......... 8
Vertex and face forming curve, not angular or greatly extending in front of eyes.......... *Pyrrhoneura*

8. Antennae reaching to anterior margin of head or beyond .......... *Kuranda*§, *Anotia*†
Antennae not reaching to anterior margin of head.......... 9

9. Antennae having one or more "palpiform" appendages at base .......... *Otiocerus*§§
Antennae without such appendages.......... 10

10. Face not spatulate at base .......... 11
Face spatulate at base.......... 12

11. Vertex curved and recurved in profile .......... *Kampulokara*
Vertex straight or with only one curve ♀ *Phantasmatocera*

12. Vertex slightly narrowed before apex but keels never touching .......... ♂ *Phantasmatocera*
Keels of vertex meeting about two-thirds from apex.......... *Swezeyia*

13. With distinct shoulder keels .......... 16
With no, or very light, shoulder keels.......... 14

14. Head round in profile, vertex not ascending.......... *Nesocora*
Head in profile with vertex ascending.......... 15

15. In profile with vertex ascending and curved backward.......... *Nesoniphas*
In profile vertex slightly ascending but not curved backward .......... *Nesoneura*

16. Subantennal process spatulate, attached to gena by slender stalk .......... 17
Subantennal process not spatulate, attached to gena by broad base .......... 18

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§ *Archa* is placed by Distant near to *Kuranda*.

† My knowledge of *Anotia* is too limited for me to give a character constant in all the species. Amalopota differs from both *Anotia* and *Kuranda* by possessing ocelli.

§§ *O. rubescens* Fowler, is not an *Otiocerus* but the figure and description does not allow me to place it with accuracy.

*Triopsis* Sign. and *Aulacocephala* Montr. are stated to be allied to *Otiocerus*.

17. Face produced well in front of eyes, antennae small with sensory organs very large ........................_Kaha_
Face not greatly produced in front of eyes, antennae larger and sensory organs not very large .............._Nesokaha_
18. Vertex truncate at apex, keels on vertex and face not contiguous ........................................_Lyricen_
Vertex acutely angular at apex, keels meeting at apex of vertex, contiguous on face to near apex...._Paralyricen_
19. In profile face not forming angle with vertex......_Makula_*
In profile face forming an angle with vertex.............20
20. In profile face very strongly curved, especially on apical half ......................................_Eosaccharissa_
In profile face not so strongly curved..................21
21. Vertex "angularly widened between eyes"......._Tapoosa_*
Vertex "conically rounded anteriorly"..........._Kamendaka_
Vertex with "its apex angulated".............._Chaprina_[†]
22. Head projecting in front of eyes twice the length of scutellum ......................................_Vivaha_*
Head not so greatly produced..........................23
23. In profile head produced to an acute angle at point of meeting of vertex and face..............._Interramma_*
In profile vertex and face not acutely angular...........24
24. Antennae large, flat and broad..............._Leptaleocera_
Antennae cylindrical ...................................25
25. Antennae long, reaching to anterior margin of head..... ..........................................._Deribia_*
Antennae not reaching to anterior margin of head......26
26. Vertex very acutely angular, base narrow, head much narrower than pronotum ..............................._Nicerta_
Vertex not acutely angular.............................27
27. Vertex truncate at apex, broad at base, head nearly as wide as pronotum . ........................_Megatropis_
Head distinctly narrower than pronotum, lateral margins of pronotum ampliated, costal margin broken by a raised portion at end of costal cell.................._Robigus_*
28. Subantennal process present............_Neocyclometopum_
Subantennal process absent ..........................29
29. Antennae distinctly longer than face............_Platocera_
Antennae not larger than face.......................... ......................_Heronax_, *_Niphadodite_, *_Phra_[‡]

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[†] The type of this genus is not in the H. S. P. A. collection and the description does not allow me to locate it with any certainty.

[‡] Distant refers this genus to _Fenuahala_ (_Heronax_). My knowledge of it does not permit me to define it.

### *Pyrrhoneura,* Kirk.

H. S. P. A. Ent. Bull. I 434.

The absence of a subantennal process separates this genus from *Nesocora,* and the circular shape of vertex and face in profile distinguishes it from the females of *Phantasmatocera.*

#### (1) *P. immaculata* sp. nov. ( ♂ ♀ ).

Pl. III f. 5.

In profile vertex and face round, subparallel to the margin of the eye. Stramineous; silghtly fuscous across the base of face; tegmina hyaline, slightly opaque with waxy secretion, veins yellowish; wings white, light-veined.

Hind margin of last abdominal segment produced angularly in middle, with a pair of contiguous, blunt, downward-pointing processes at apex. Male pygophor slightly emarginate on ventral edge, rounded slightly on the sides, with a small angular projection from the inside; anal segment long, with anus at apex, a small downward-turned, truncate process beyond anus; a little before middle the sides produced into small angles; styles as long as anal segment, curved along the lower edge, sinuous along upper edge, apex turned upward.

Length 2.5 mm.; tegmen 4 mm.

Hab.: Amboina.

#### (2) *P. rubida* sp. nov. ( ♂ ).

The keels on face contiguous on basal half, thus being nearer to *citharista* than *saccharicida.* Dark red; facial keels, labium and legs yellowish; tegmina uniformly fuscous with red veins, wings higher fuscous with red veins; both wings and tegmina opaque with waxy secretion.

Length 2 mm.; tegmen 3.4 mm.

Habitat: Rewa, Fiji.

### *Kampulokara* gen. nov.

Type *caenosum.*

Head slightly narrower than pronotum. In profile vertex curved and recurved; face sinuous; pointed at junction of vertex and face; antennae cylindrical, set low down on gena, reaching to top of eye; eye round, slightly emarginate below. Base of vertex wide, roundly emarginate, without keel; sides with wide keels beset with wax pits, vertex narrowing towards apex, which is slightly emarginate; face slightly widening to apex, keels shallow at base, deepening toward apex;clypeus tricarnate, median one obscure; pronotum short, sinuously, angularly emarginate behind; scutellum a little longer than wide, lateral angles slightly behind middle; central carina obscure; lateral carinae well elevated in middle, appearing as two small, longish tubercles. Tegmina differing from *Phantasmatocera* in having the first median section forked and the cubitus simple. This genus comes near to *Swezeyia* and *Phantasmatocera*.

(1) *D. caenosum* sp. nov. (♀).

Pl. II fig. 4, 4a, Pl. III fig. 7.

Stramineous, fuscous mark across gena, lateral portion of pronotum and scutellum, eye black; tegmina and wings hyaline, opaquely white with waxy secretion, white-veined; radia, media and cubitus tinged with black, slightly fuscous in clavus.

Length of body 2.5 mm.; tegmen 3.8 mm.

Habitat: Larat.

*Phantasmatocera*, Kirk.

H. S. P. A. Ent. Bull. I 430. Bull. III 177.
*Arunta* Distant, A. M. N. H. (7) XIX 406.
*Nesophantasma* Kirk. Ent. Bull. III 177.

Kirkaldy erected this genus for two species, *arborea* (type) and *vitiensis;* subsequently he erected a new genus, *Nesophantasma*, for the latter species. I now have two species which agree with *Phantasmatocera*, all the specimens being males, and nine species which agree with *Nesophantasma*, all the specimens being females, two of which agree in all details, except the shape of the head, to *P. arborea* and *P. nigromaculata*. The two species, *lalokensis* and *papuensis*, are only represented by females and the shape of the head is intermediate. I believe that this is a genus with slight sexual dimorphism in the shape of the head and that Kirkaldy was correct in his original decision, which I revert to.

(1) *P. arborea* Kirk. (♂ ♀).

Pl. I f. 10-a.

*Arunta rubrovenosa*, Dist. A. M. N. H. (7) XIX 406.

(♀) The marking agree with the male. Vertex very slightly narrowing toward apex, sides very slightly sinuous, face subparallel sided, antennae reaching slightly beyond eyes, smaller than in male; posterior margin of last ventral abdominal segment widely angular, the apex produced into two small points, turned somewhat ventrally, in profile angular near base.

### (1) *P. nigromaculata* ( ♂ ♀ ), sp. nov.

( ♂ ) Face not quite so spatulate at base as in type, antennae longer and flatter, reaching to front of head. Stramineous, a broad fuscous band from base of face, through eye, sides of pronotum and scutellum; clypeus, antennae and apical portion of face fuscous, posterior ventral portions of abdomen fuscous; tegmina opaquely white with waxy secretion, with nine or ten black spots as follows: one in clavus, base of media, middle of cubitus, end of cubitus, base of three median sectors and at base of third apical median cell, the dots spreading out along nerves in some cases; wings hyaline, light-veined, opaquely white with waxy secretion.

( ♀ ) Slightly lighter in color than male; antennae reaching in length beyond eyes; vertex very slightly sinuate along sides, face nearly parallel sided. Posterior margin of last ventral plate roundly produced in middle, finely cleft in center.

Length of abdomen 2 mm.; tegmen 3.7 mm.

Habitat: Larat.

### (3) *P. lalokensis* sp. nov. ( ♀ ).

Pl. I f. 17.

Vertex narrowing slightly toward apex, face subparallel sided; antennae reaching slightly beyond eyes. In coloration body and head as in *nigromaculata*. Tegmina hyaline, opaquely white with fuscous secretion, veins in apical half tinged with red, fuscous in base of clavus, two spots in cubital cell, fuscous along the sides of media and spreading into apex of subcostal cell, black spot at base of third, and fuscous in last two apical, median cells; wings hyaline, opaquely white with waxy secretion, veins in middle wing red. Hind margin of last abdominal segment widely angular, the apex finely cleft.

Length of body 3 mm.; tegmen 4 mm.

Habitat: Laloki.

### (4) *P. papuana* sp. nov. ( ♀ ).

Pl. I f. 16.

Sides of vertex more sinuous than in *lalokensis*, face narrower. Color as in *lalokensis*, but darker, the whole abdomen being dark fuscous. Tegmina as in *lalokensis*, but the fuscousness much less diffused. Hind margin of last abdominal segment drawn out into a long broad process in middle, with two rounded contiguous points at apex.

Length of body 2.7 mm.; tegmen 4.2 mm.

Habitat: Laloki.

### (5) *P. vitiensis* Kirk. (♀).

Pl. I f. 15.

*Phantasmatocera vitiensis,* Kirk. H. S. P. A. Ent. Bull. I.
*Nesophantasma vitiensis,* Kirk. H. S. P. A. Ent. Bull. III.

Vertex shorter than in last four species, very slightly narrowed toward apex; lateral margins of face subparallel; very slightly narrowed toward apex; profile of head squarer than in *arborea,* antennae reaching slightly beyond eyes, yellowish Hind margin of last ventral abdominal plate gradually produced medianly, the apex forming two rounded lobes.

### (6) *P. unopunctata* sp. nov. (♀).

Pl. I fig. 12.

In profile head slightly longer, narrower and more ascending than *vitiensis.* Stramineous, faint fuscous mark on gena through eye to lateral angle of scutellum; clypeus and ventral portions of abdomen not fuscous; antennae reaching slightly beyond eye, yellowish; tegminae opaquely white from waxy secretion; veins reddish, especially on apical half, a fuscous mark running longitudinally through tegmen, darkest at base; a black spot at base of second and third apical median cells. Hind margin of last ventral abdominal segment angular, the apex angularly emarginate.

The male I associate with this species has the head very greatly produced, the keels of vertex meeting together before the expanded apex, thus approaching the genus *Swezeyia*; the antennae reach beyond eyes and have the sense organs along the edges dark; the coloration is the same as the female. Male pygophor with a small, angular, lateral projection, anal segment about twice as long as broad, widest at base, truncate at end, anus situated at apex; styles long, reaching slightly beyond anal segment, broadened and curved at apex, with a small emargination on dorsal edge near apex.

Length of body 2.6 mm.; tegmen 4 mm.

Habitat: Amboina.

### (7) *P. pallidocornis* sp. nov. (♀).

Pl. I f. 13.

In profile head approaching *vitiensis*, but narrowed anteriorly. Stramineous, antennae of same color, mark on gena to scutellum indistinct ;tegmina hyaline, opaque with waxy secretions, two fuscous marks in cubital cell, along sides of media and apex of sectors, apical cells cloudy, black spot at base of second and third apical median cells. Hind margin of last ventral abdominal plate like *vitiensis*, but not so much produced.

Length of body 2.3 mm.; tegmen 3.3 mm.

Habitat: Larat.

### (8) *P. pseudopalidocornis* sp. nov. (♀).

Pl. I f. 14.

I have specimens from Queensland which I can only distinguish from *palidocornis* with certainty by the last ventral abdominal plate, which is more roundly produced, narrower, and the ventral lobes (sheaths) narrower.

Length 2.4 mm.; tegmen 3.5 mm.

Habitat: Queensland.

### (9) *P. nigricornis* sp. nov. (♀).

Pl. I fig. 9.

In profile head between *unopunctata* and *pallidocornis*. Stramineous, the dark mark on gena, through eye, to lateral angles of scutellum, plain; antennae dark, beset with darker sense organs; tegmina hyaline, opaquely white with waxy secretions, tinged with yellow on basal half, veins yellowish, anterior half of media and bases of sectors blackish, small black spot at base of second and third apical median cells; wings opaquely white, yellow-veined. Hind margin of last abdominal ventral plate produced in middle angularly, the apex produced into two contiguous, pointed processes, standing out at an angle to surface of plate.

Length 2.3 mm.; tegmen 3.5 mm.

Habitat: Larat.

### (10) *P. pseudonigricornis* sp. nov. (♀).

Pl. I f. 8.

This differs from *nigricornis* in having the central half of the last ventral abdominal plate steeply produced and angularly emarginate at the apex.

Length 2.4 mm.; tegmen 3.8 mm.

Habitat: Larat.

### (11) *P. ambigua* sp. nov. ( ♀ ).

Pl. I fig. 11.

Head in profile near to *vitiensis*, but slightly shorter and broader. Stramineous, fuscous mark on gena, through eye, to lateral angle of scutellum; antenna light, with darker sense organs; tegmina hyaline, slightly clouded and partly opaque with waxy secretion, distal portion of radial, median and cubital systems red, fuscous in clavus, dark spot at base of second and third apical radial cells. Wings opaquely white, reddish veined. Hind margin of last abdominal plate fairly steeply produced in middle, roundly bilobed at apex.

Length of abdomen 2.4 mm.; tegmen 3.5 mm.

Habitat: Larat.

## *Swezeyia,* Kirk.

H. S. P. A. Ent. Bull. I, 430.

### (1) *S. laratica* sp. nov. ( ♂ ).

Pls. I ff19, 19a, III f. 11.

This species differs from the type (*lyricen*) in having the anterior part of the head in lateral view broader and not upwardly curved; it stands between *S. lyricen* and *Phantasmatocera*. Considering the great range of the shape of head in allied genera, I do not consider it advisable to genericly separate this species, although it differs so considerably from *S. lyricen*. Head, thorax, legs and abdomen stramineous, a fuscous mark across gena, through eye and sides of pronotum, and scutellum; tegmina hyaline, opaquely white with waxy secretion, infuscate down center and on apical cells, a dark mark at base of third apical median cell; wings hyaline, white-veined.

Length of body 2 mm.; tegmen 3 mm.

Habitat: Larat.

## *Nesocora,* Kirk.

H. S. P. A. Ent. Bull. III 172.

### (1) *N. crocea* sp. nov. ( ♂ ).

Keels on face not contiguous. Saffron, keels of face and dorsum of abdomen fuscous; tegmina hyaline, opaque with waxy secretion; centrally irregularly suffused over greater portion with fuscous, veins yellowish red; wings fuscous, dark-veined.

Length of abdomen 2.3 mm.; tegmen 3.7 mm.

Habitat: Fiji, on sugar cane.

### (2) *N. coccinea* sp. nov. ( ♂ ).

Keels of face contiguous to near apex (in *fidicina* Kirk. they are not contiguous) scarlet, antennae, clypeus, legs and genital style yellowish; tegmina fuscous hyaline, scarlet-veined, except basal half of subcostal, radia, and radial cross vein, which are white, a dark spot at base of third apical-median cell.

Length of abdomen 2.6 mm.; tegmen 3.8 mm.

I include this species in the genus, although it has the facial keels contiguous.

### *Nesoneura,* Kirk.

Subgenus of Pyrrhoneura, H. S. P. A. Ent. Bull. III p. 171.

The presence of a sub-antennal process, and the shape of head in profile, separates this as a genus from *Pyrrhoneura.*

### *Nesokaha* gen. nov.

Type *piroensis.*

In profile angulate at junction of vertex and face, vertex slightly convex, base of face very slightly concave, then evenly and convexly curved to apex; vertex triangular, roundly and shallowly emarginate at base, which is without keel; sides slightly longer than base, with deep keels meeting at apex, studded with wax pits along edges; face very narrow, keels contiguous to near apex; clypeus rounded, tricarinate at base; antennae about twice as long as broad, sense organs well elevated above surface; sub-antennal process spatulate, with narrow stalk; gena beneath eyes twice as broad as in front of eyes; pronotum fairly short, angularly emarginate behind, shoulder keels well developed; scutellum about as long as broad, lateral angles about middle, tricarinate on anterior half. Tegmina pointed at apex and ampliated beyond clavus, neuration as in *Kaha,* but with two more apical median veins.

### (1) *N. piroensis* sp. nov. ( ♀ ).

Pls. II f. 7, III f. 13.

Head and thorax dorsally reddish brown, ventrally yellowish, including antennae and legs. Tegmina opaquely fuscous, red veined, which are brightest towards apex of tegmina; some light and more transparent spots in clavus, cubital and median cells, wings fuscous, dark-veined.

Length of body 2.6 mm.; tegmen 4.5 mm.

Habitat: Piroe, Ceram.

### *Kaha,* Kirkaldy.

#### (1) *K. extrema* sp. nov. (♀).

Reddish brown, upper portion of face reddish brown, lower portion white, semitransparent; tegmina hyaline, fuscous, red-veined, lighter across clavus and middle of median cell; a series of five small, triangular, white marks through apical portion of costal cell, a black mark over bases of second and third apical median cell, wings fuscous, red-veined.

Length of body 2.7 mm.; tegmen 3.7 mm.

Habitat: Amboina.

#### (2) *K. media* sp. nov. (♀).

Pl. II f. 11.

Head as in *extrema,* but processes on antennae not so long. Reddish brown; genae semitransparent, dark round lower portion of eye, extending as three angular markings to edge of face; clypeus and legs lighter; light streak down middle of scutellum; tegmina fuscous, markings as in *extrema* but darker, wings fuscous, red-veined.

Length of body 3 mm.; tegmen 6 mm.

Habitat: Mowong.

#### (3) *K. ceramensis* sp. nov. (♂).

Agreeing in structure with type (*perfecta*), head in lateral view not extending so far as in *media.* Upper half of face black, lower half transparent; clypeus and apex of face black, antennae light yellow; pronotum and scutellum reddish-brown with broad yellowish mark over keels; legs and genital styles yellowish, abdomen fuscous; tegmina and wings as in *media.*

Length of body 1.8 mm.; tegmen 3 mm.

Habitat: Ceram.

### *Paralyricen* gen. nov.

Type *jepsoni.*

Head in profile projecting in front of eye, subovate in outline; antennae short, elongate ovate, about twice as long as broad; subantennal flange large, stretching from back of gena to near facial keels; eye broader than deep, emarginate on lower edge. Vertex projecting beyond eyes, narrow, acutely angular, hind margin roundly emarginate with fine shallow keel, sides evenly converging to apex where the deep lateral keels meet; face very narrow, keels contiguous from base to near apex; clypeus slightly longer than face, flattened, distinctly tricarinate; pronotum very short, perpendicular in middle, shoulder keels very large, forming very complete antennal chamber, posteriorly deeply angularly emarginate in middle; scutellum slightly longer than wide, the lateral angles slightly behind middle, without carinae or with three very obscure carinae (three light marks on some specimens look superficially like distinct carinae). Tegmina as in *Lyricen*, a little broader in proportion to length. *Lyricen* differs from this genus in having a subparallel-sided vertex with a truncate apex, lateral keels of face never contiguous, face widening from vertex to below eyes, then subparallel; clypeus conspicuously flattened on sides, long and narrow in front, distinctly tricarinate.

### (1) *P. jepsoni* sp. nov. (♂ ♀).

Pls. II f. 10, III f. 9.

Head, body and legs light yellow, fuscous on gena in front of the dark brown eye; tegmina and wings hyaline with white veins, sometimes suffused with fuscous over apical cells, both opaquely white with waxy secretion. Hind margin of last abdominal ventral plate of female angularly produced, the side of the produced portion being evenly and concavely curved and starting from the lateral angles of the plate. Male genital styles narrow, sinuous, subparallel sided, rounded at apex.

Length of body 3 mm.; tegmen 5 mm.

Habitat: Fiji. I take the pleasure of naming this little insect after Mr. F. Jepson of Fiji.

### (2) *P. knowlesi* (♂).

Head, body and legs reddish-yellow, three distinct carinae on scutellum, tegmina yellowish hyaline with darker veins, wings hyaline with yellowish veins; tegmina and wings slightly opaque with waxy secretion. Male genital styles evenly curved along edge, roundly expanded on apical two-thirds of upper edge, with a small round emargination about middle, apex pointed.

Length of body 2.5 mm.; tegmen 5 mm.

Habitat: Fiji. I take the pleasure of naming this little insect after Mr. C. H. Knowles of Suva.

## *Eosaccharissa* Kirkaldy.

An. Soc. Ent. Belg. LI. 126.

Type *E. Javana* Kirk.

I cannot find the type of this genus among Kirkaldy's collection, but my specimens of *javana* were taken in Java on sugar-cane and conform to his description. I have recharacterized the genus and figured the head of *laratica*.

In profile vertex flat, projecting slightly beyond base of face; face curved slightly at base, more strongly at apex; vertex angular, sides with wide, slightly curved keels, beset with wax pits, base roundly shallowly emarginate, unkeeled; face between eyes narrow (keels contiguous), thence widening; antennae less than the length of an eye, largest at apex; clypeus rounded, laterally carinate at base; pronotum short, deeply angularly emarginate behind; shoulder keels very small; scutellum longer than broad, lateral angles behind middle, tricarinate. This genus differs from *Kamendaka* in having its vertex projecting slightly beyond base of face and the apex of face strongly curved.

### (1) *E. javana* (♂ ♀).

Habitat: Pekalongan, Roban, Piroe and Amboina, on sugar-cane.

### (2) *E. laratica* sp. nov. (♂).

Pl. I f. 18.

Stramineous, fuscous on gena round ocellus and on dorsum of abdomen; eyes dark castaneous; tegmina hyaline, opaquely white with waxy secretion, apical portion of veins yellowish, light yellow spot in clavus, another at base of radia, a band from apex of clavus to base of first median sector, a spot in middle of costal and subcostal cells, all more or less obscured by waxy secretion; wings hyaline, opaquely white with waxy secretion, dark-veined.

Length 3 mm.; tegmen 3.8 mm.

Habitat: Larat, on sugar-cane.

### (3) *E. obscura* sp. nov. (♀).

Stramineous, fuscous on clypeus, ventral portion of thorax and abdomen; front tarsi and marks on tibiae and femora fuscous; tegmina hyaline, opaquely white with waxy secretion, veins yellowish, a light yellowish mark over base of radial and medial cells, apical half of tegmina suffusely light yellow, first and second median apical cells fuscous; wings hyaline, opaquely white with waxy secretion, dark-veined.

Length: 2.5 mm.; tegmen 3.8 mm.

Habitat: Larat, on sugar-cane.

It is possible that this is the female of *laratica*.

### (4) *E. sordida* ( ♂ ) sp. nov.

Antennae smaller than in *laratica*. Stramineous, legs lighter; fuscous band across gena to the castaneous eye; tegmina dirty brown, lighter along costal and apical margin, veins slightly darker; wings fuscous, dark-veined; wings and tegmina opaque with waxy secretion.

Length 2 mm.; tegmen 3.5 mm.

Habitat: Pekalongan, on sugar-cane.

## *Kamendaka,* Distant.

Faun. Brit. Ind. Rhyn. III p. 310.

### (1) *K. australis* sp. nov. ( ♀ ).

In profile vertex slightly ascending, keels on face contiguous basal two-thirds; tegmina pointed at region of first three apical median veins, otherwise agrees structurally with description of type. Stramineous, reddish on vertex and on clypeus; eyes reddish-brown; tegmina hyaline slightly opaquely white with waxy secretion, veins yellowish, irregular stramineous markings from costa across base of radial cell to hind margin, broad along the hind margin and over the apical portion of radial cell, fuscous in subcostal, radial-apical, second, third and fifth median apical cells and two black spots in costal cell; wings hyaline, white-veined, opaquely white with waxy secretion.

Length 2.5 mm.; tegmen 4.0 mm.

Habitat: Cairns, on sugar-cane. (Perkins and Koebele coll.)

### (2) *K. javana* sp. nov. ( ♂ ).

In profile vertex slightly shorter than *australis*. Face very narrow but keels not contiguous. Stramineous; dorsum of abdomen slightly fuscous, eye castaneous, tegmina hyaline tinged with yellow, which is mostly confined to posterior half, a round black dot in third median apical cell.

Length 2 mm.; tegmen 3 mm.

Habitat: Java, on sugar cane.

### (3) *K. versicolor* sp. nov. ( ♂ ).

Vertex slightly more ascending than in *australis,* angulation of vertex with face more acute, face very narrow but keels not contiguous.

Stramineous; dorsum of abdomen fuscous also across anterior coxae; tegminae hyaline, opaquely white with waxy secretion, yellow-veined, irregular stramineous, markings in base of claval, middle of medial, middle of costal, and radial cells, apex of medial and claval cells, also across apical portion of tegmina, black marks in two of the radial-apical and two of the medial-apical cells and some irregular fuscous markings on the stramineous bands.

Length 2 mm.; tegmen 3.3 mm.

Habitat: Amboina, on sugar-cane.

### (4) *K. amboinensis* sp. nov. (♂ ♀).

Pale yellow; in male the dorsal surface of abdomen fuscous; vertex and basal portion of facial keels fuscous, reddish patch on gena between base of face and eye; tegmina hyaline, opaquely white with waxy secretion, veins yellowish, a fuscous mark through middle of costal and apex of radial and medial cells, a dark spot in apex of clavus.

Length 3 mm.; tegmen 4.6 mm.

Habitat: Amboina, on sugar-cane.

This species is somewhat like *spectra* Dist., but the first and second median sectors arise very near together, and the apex of the tegmina are angularly produced from first to fourth apical median veins.

## *Nicerta*, Walker.

Jour. Lin. Soc. London I 159, pl. 8, figs. 5-5a.

### (1) *N. cruenta* sp. nov. (♀).

In profile head conically produced in front, slightly ascending. Head much narrower than pronotum; vertex long and narrow, base roundly emarginate, without keel, sides deeply keeled, meeting at apex; face very narrow, composed of contiguous keels which do not part at apex; clypeus shorter than face, well rounded, without carinae, labium shorter than clypeus, reaching to hind coxae; antennae cylindrical, slightly constricted in middle, extending slightly beyond eyes. Tegmina long and narrow, costal, radial and median cells long, extending along two-thirds of the tegmen, forking of cubitus beyond middle, three median sectors in apical fourth of tegmina.

Yellow, eye reddish-brown, red streak across gena, genae around antennae and antennae tinged with red, an irregular blood-red streak across base of tegmina, another across middle of clavus to cubitus, through middle of costa to media, two small spots on basal half of costa, a spot at base of first median sector, and several small red marks in apical cells; wings hyaline, opaque with waxy secretions, yellow-veined.

Length 3.7 mm.; tegmen 6 mm.

Habitat: Amboina.

This appears to come near to *N. fervens,* Walker.

### *Megatropis* nov. gen.

Type *coccineolinea.*

In profile head semicircular to oblong, gena wide or very wide in front of eye. Head slightly narrower than pronotum, vertex broad at base, roundly emarginate, without keel, apex truncate, half the width of base, sides straight, evenly converging to apex, with deep keels, beset along edge with wax pits; face narrow, parallel sided to apex, keels of vertex continued down sides of face, the edge of the keels sometimes touch one another but are not contiguous at their bases; clypeus shorter than face, wide at base and rounded, very obscurely tricarinate; labium (beyond clypeus) half as long as clypeus. Antennae cylindrical, simple, with a round projection, or a distinct prong, at base, distally notched or slightly bilobed where arista is articulated; pronotum very narrow, shallowly and widely emarginate behind, median portion fitting into the emarginate vertex; scutellum slightly broader than long, lateral angles a little before middle, anteriorly rounded, posteriorly angular. Tegmina about four times longer than broad; subcosta and radia forking before the middle, cubitus forking about same distance from base, three median sectors in apical third of tegmen, end of clavus beyond middle of tegmen.

I separate this genus from *Nicerta* on the width of the head, vertex and face, also on the nature of the facial keels. It may represent some species of Walker's *Interamma*, but as I am unable to recognize his forms I shall consider Melichar's *I. rubrofasciata* as the representative of that genus. Of the genus *Deribia* I only know *D.* (*Anotia*) *coccinea* Guer. through Cuvier's Iconog. and Girard's Trait. d'Ent.

#### (1) *M. coccineolinea* sp. nov. (♂ ♀).

Fig. Pls. II f. 2, III f. 14.

Uniformly very pale yellow, eyes dark brown, a tinge of red on gena in front of eye; tegmina hyaline, opaquely white with waxy secretion, a crimson line from base to apex through middle of tegmen, anterior apical margin tinged with red; wings hyaline opaquely white with waxy secretion. Antenna reaching slightly beyond eye, cylindrical, slightly constricted in middle, without any projection or fork at base.

Length 3.8 mm.; tegmen 6 mm.

Habitat: Mowong.

### (3) *M. immaculata* sp. nov. (♀).

Structurally agreeing with type. Pale yellow, eyes brown, gena tinged with red before eye, tegmina and wings hyaline, opaquely white with waxy secretion, tegmina tinged with yellow, yellow-veined. Hind margin of last ventral abdominal plate roundly and bluntly produced.

Length 3.3 mm.; tegmen 5.4 mm.

Habitat: Amboina; Teloc Ayer.

### (3) *M. pallida* sp. nov. (♂ ♀).

Antennae a little longer than head, a very short prong, or big tubercle, projecting from the base. Hind margin of last ventral plate of female angularly produced, centrally depressed or lipped (like on a jug). General facies as in *immaculata.*

Length 3 mm.; tegmen 5 mm.

Habitat: Teloc Ayer.

### (4) *M. flexicornis* sp. nov. (♂).

This has the general facies of the last two, but the prong of the antennae is nearly as long as the main branch, the two forming a horse-shoe-shaped organ. The genitalia separates it from the male *pallida,* the genital styles being narrower and the anal tube produced into a blunt, ventral, median process.

Length 3 mm.; tegmen 5 mm.

Habitat: Pontianak.

### (5) *M. rubella* sp. nov. (♀).

Head much more produced in front than in the type, prong of antennae two-thirds the size of main branch, lying alongside of it. Vertex, upper portion of gena, middle of pronotum and scutellum, tinged with scarlet. Hind margin of last ventral plate roundly produced.

Length 4 mm.; tegmen broken.

Habitat: Amboina.

Only one specimen with tegmina in bad condition.

### *Leptaleocera* gen nov.

Type *coccinea*.

In profile vertex and face forming two curves; eyes long and narrow, the hind margin being deeply emarginate; edge of face subparallel to edge of eye. Vertex narrow and angular, base roundly emarginate, without keel; sides with very deep keels meeting at apex; face linear, keels contiguous right up to apex; clypeus about as long as face, rounded, obscurely carinate in middle, no lateral carinae; labium short, about one-third the length of clypeus; antennae large, flat, thin, slightly thickened round edges; pronotum very short, projecting well into excavated vertex; scutellum about as long as broad, rounded anteriorly, obtusely angular behind, lateral angles behind middle, no carinae. Tegmina long and narrow, subcosta and radia forking well beyond middle, subcostal cell small, cubitus forking before middle, four median sectors in apical third of tegmina, last one very small.

#### (1) *L. coccinea* sp. nov. (♂).

Pls. II f. 5, III f. 15.

Thorax, legs and abdomen reddish-yellow, eyes black; tegmina and wings scarlet, some darker and more opaque spots in cells between end of clavus and subcostal cell, also in apical median cells.

Habitat: Teloc Ayer.

Length of body 3.7 mm.; tegmen, 5.4 mm.

### *Heronax,* Kirkaldy.

H. S. P. A. Ent. Bull. I 431.

*Fenuahala,* Distant. A.M.N.H. (7), XIX 411.

#### (1) *H. parnassius* Kirk. (♀).

This species, which is the type of the genus, has the base of face slightly convex, the point of junction of face and vertex angulate in profile. Hind margin of last abdominal ventral plate of female obtusely angular, the sides of the production starting from lateral margin, slightly sinuous, apex finely pointed and turned upward, finely grooved from apex to near basal margin, the anterior styles long and finely pointed. Until I know the shape of the last abdominal ventral plate and the profile of the head of *H.* (*Fenuahala*) *infuscata* Distant, I cannot accept Kirkaldy's synonymy of it with *parnassius*.

### (2) *H. saccharivora* Kirk. ( ♀ ).

This species has the vertex somewhat elevated but there is no angulation between vertex and face; the last abdominal ventral plate produced angularly in middle half, without groove down middle; anterior genital styles shorter and not so pointed as in *parnassius*.

### (3) *H. lalokensis* sp. nov. ( ♂ ♀ ).

Head in profile with vertex and face forming one curve, antennae nearly as long as head, broad, flattened. Male genital styles about three times as long as broad, subparallel sided, slightly angular in middle, apex with small, curved point, anal segment with a downward curved point at apex; sides of pygophor acutely angularly produced. The last abdominal ventral plate of female with hind margin widely angularly produced, with a deep medial groove down apical third. Stramineous; tegmina and wings hyaline with yellow veins, subopaque with waxy secretion; two circular broad yellowish bands across tegmina, the first passing over the median crossvein and the other over the bases of second and third median sectors; irregular yellowish spots in apical cells and on basal third.

Length 2.3 mm.; tegmen 5.4 mm.

Habitat: Laloki.

### *Platocera* gen. nov.

Type *annulipes*.

In profile head conically projecting at junction of vertex and face; vertex ascending, face gradually curved; gena at middle of face about half the width of an eye. Vertex narrow, acutely angular, base roundly excavate, not keeled, keels along lateral margins deep, meeting at apex, beset with wax pits; face very narrow, keels contiguous to near apex; clypeus large, rounded, obscurely tricarinate; antennae very large, flat, thin, subequal in width throughout, truncate at apex, conspicuously angularly bent at base, forming a disk-like base at right angles to distal portion; pronotum very short, no shoulder keels; scutellum distinctly shorter than broad, lateral angles situated behind middle, without carinae. Neuration of tegmina near *Heronax*, first median sector leaving media at junction of media and radia. *Niphadodite* Kirk. was founded upon a unique which is missing from the collection. It appears to be near this genus, especially to *nigrofrons*.

### (1) *P. annulipes* sp. nov. (♂).

Pls. II f. 9, III f. 3.

Stramineous, fuscous along sides of face and apex of clypeus; front and middle legs with two black rings on tibiae, and a black streak down femora, hind legs with apex of femora black; apex of labium black; tegmina hyaline with yellowish veins, a broken fuscous mark across tegmina about middle of clavus and another, less broken, at first median sector; a series of fuscous marks in costal cell, apical veins fuscous.

Length 2.3 mm.; tegmen 3.7 mm.

Habitat: Amboina.

### (2) *P. nigrifrons* sp. nov. (♂).

Antennae not quite so large as *annulipes*, narrowed at base and apex, the basal disc not being so large, appearing more as a swelling at base; media with four sectors. Face, antennae, clypeus, ventral aspects of thorax and abdomen and sides of pronotum and scutellum fuscous, legs, vertex, median portion of pronotum and scutellum and dorsal aspect of abdomen fuscous yellow. Tegmina hyaline, slightly opaque with waxy secretion, yellowish veins spotted with black, the black spreading into cell in clavus, and at base of second median sector; wings hyaline with yellowish veins, slight opaque with waxy secretion.

Length 2.3 mm.; tegmen 5.4 mm.

Habitat: Larat.

### *Neocyclometopum* gen. nov.

Type *sordidum*.

In profile vertex and face rounded, the apical portion of face being slightly flattened; subantennal flange rising from round the base of antennae, large and foliaceous; antenna subtriangular, just reaching to eye. Vertex acutely triangular, base fairly broad, roundly, shallowly emarginate, without keel; lateral keels deep, obscurely beset with wax pits, converging towards apex and continuing down face, where they are contiguous for some distance; clypeus slightly larger than face, flattened, especially at sides, obscurely tricarinate; pronotum very short, perpendicular in middle, widely, angularly emarginate behind, shoulder keels large; scutellum about as wide as long, lateral angles well behind middle, without carinae. Tegmina near to *Platocera*, but with four median sectors, the median cross-vein joining media slightly before the forking of radia and media.

### (1) *N. sordidum* sp. nov. (♂).

Pl. II fig. 3.

Antennae flattened, subtriangular, attached to head at one of the angles, the edge grooved, appearing as if the antenna was composed of two plates. Dirty yellow, genae, antennae, clypeus and lateral portions of pronotum fuscous, scutellum fuscous with three indistinct yellowish longitudinal marks, ventral aspect of abdomen fuscous; genital styles yellow; tegmina hyaline, with irregular markings along veins, several fuscous spots in costal cell; wings dirty hyaline, dark veined; both tegmina and wings semiopaque with waxy secretions.

Length 3 mm.; tegmen 6 mm.
Habitat: Larat.

### (2) *N. borneoensis* sp. nov. (♂ ♀).

In profile gena not so wide as in *sordida,* face not so flat in profile, antennae conical, widest at base, a little longer than wide. Fuscous yellow, face, antennae, legs and basal ventral portion of abdomen fuscous; tegmina and wings hyaline, yellow-veined, slightly opaque with waxy secretion, tegmina reddish along costa.

Length 2.5 mm.; tegmen 5 mm.
Habitat: Mowong.

## GROUP III.

1. Subcosta and radia contiguous to near their ends, subcostal cell very short or absent, eyes in front reaching to the base of the clypeus.......................... 2
Subcostal cell long, sometimes very narrow, eyes in front not reaching to base of clypeus.................... 4
2. Antennae flat, as long as from apex of vertex to end of scutellum ..................................*Muiria*
Antennae not so long .............................. 3
3. Radial cell reaching to middle of tegmen or beyond, very narrow . ..............................*Leomelicharia*
Radial cell not reaching to middle of tegmen, not very narrow ......................................*Sikaiana*
4. Shoulder keel large, subantennal process present..*Zeugma*
Shoulder keels not large, no subantennal process....... 5
5. Antennae large, longer than face...................... 6
Antennae not longer than face....................... 8

6. Antennae cylindrical .... *Zoraida*
Antennae flat .... 7
7. Scutellum without carinae .... *Peggia**
Scutellum with three carinae .... *Peggiopsis*
8. Head as wide, or wider than, pronotum .... *Philadelphia, Fescennia?**
Head not as wide as pronotum .... 9
9. Face centrally carinate .... *Pamandanga**
Face not centrally carinate .... 10
10. Head in profile projecting angularly in front of eyes .... *Jada*, Helcita?**
Head in profile not projecting angularly in front of eyes .. 11
11. Clypeus rounded, carinae indistinct .... 12
Carinae on clypeus very distinct .... 13
12. Subcosta and radia forking at or beyond middle of tegmen .... *Diostrombus*
Subcosta and radia forking before middle of tegmen .... *Camma**
13. Face slightly widened apically (carinae diverging), tegmen truncate at apex .... *Afaka**
Face with carinae contiguous to apex, tegmen not truncate at apex .... 14
14. Face longer than clypeus; five median sectors, first furcate .... *Phenice**
Clypeus longer than face .... 15
15. Media with five or six unbranched sectors .... *Proutista*
Media with six sectors, the third furcate .... *Paraproutista*

### *Sikaiana* Distant.

A. M. N. H. (7) XIX p. 398.

Mr. Distant suggests that this genus may be allied to *Basileocephalus*, but apart from the tegmina, which places it in a different section of the *Derbidae*, the pronotum alone would separate it very distinctly. *Muiria* and *Leomelicharia* are very closely allied to it. None of the species that I place in this genus have carinae on the clypeus.

### (1) *S. fulva* sp. nov. (♀).

Head, thorax and abdomen light stramineous fuscously mottled, legs lighter; tegmina vitreous, iridescent, costa red, broken up into minute spots by small patches of wax; veins brown, red towards apex, a small brown streak across extreme base, another across costa and radial cells a little higher up, a larger mark through middle of costal and radial, and apex of median, cells, continued as a hairstreak to hind margin, a hairstreak through costal and radial cells near apex, apical veins bordered with fuscous brown, leaving white spots in middle of cells; wings very short reaching hind margin of second abdominal segment, truncate at apex, large anal area with stridulating surface.

Length 1.5 mm.; tegmen 3.4 mm.
Habitat: Larat.

### (2) *S. straminea* sp. nov. (♂ ♀).

Head, thorax and abdomen stramineous, eyes dark castaneous; tegmina hyaline slightly opaque; veins yellowish, costa and apex of subcosta, radia and media reddish, irregularly and faintly fuscous along veins; wings reaching nearly to end of abdomen, costa with apical half emarginate causing angulation in middle, apically pointed; anal area large with stridulating surface.

Length 1.5 mm.; tegmen 3.8 mm.
Habitat: Larat.

### (3) *S. caenosa* sp. nov. (♀).

Thorax, legs and dorsal surface of abdomen dirty yellow, head, antennae and ventral surface of abdomen darker, eyes dark castaneous; tegmina hyaline, iridescent, veins yellowish, fuscous spot at base of first median sector, a small one near base of media and another on second cubital vein; wings about three fourth length of abdomen, costa strongly angular a little before middle, apical half narrow, apex rounded, anal area large, with stridulating surface.

Length 1.5 mm.; tegmen 3.8 mm.
Habitat: Larat.

### (4) *S. nigrimaculata* sp. nov. (♀).

Dirty yellow; head, pronotum and three longitudinal marks on scutellum lighter, abdomen with darker brown markings, eyes castaneous; tegmina hyaline, slightly opaque, a round black spot at base of first median sector, wings a little longer than abdomen, costa slightly angular one third from base, apical portion as broad as base, apex subtruncate with black spot in middle of apical area.

Length 1.5 mm.; tegmen 3.8 mm.
Habitat: Larat.

### (5) [*S. clymene* sp. nov. (Kirk.)

Pale luteous, the antennae and the mesonotum laterally rather darker. Beneath, and the legs, testaceous, extreme apex of the hind tibiae blackish; extreme apex of the antennae fuscous. Tegmina hyaline, iridescent, veins pale yellow, three percurrent transverse, ashy yellowish, narrow bands (two on the basal third, one just apical of the middle), also two not extending to the middle of the tegmina interiorly (between two and three, and three and the apex), the radial and median veins are also the same color on their apical two-thirds, and the apical veins are all more or less similarly suffused; costal vein pale, speckled closely with sanguineous. Wings hyaline, veins yellowish.

Length 1½ mm.; expanse about 10 mm.

Habitat: Larat (Muir).

G. W. K.]

### *Loemelicharia* gen. nov.

Type *rufovittata*.

Head in profile with vertex flattened and face curved, face projecting very slightly in front of eyes, gena of equal width all round eyes, eyes large, reaching to apex of face, deeply emarginate behind; antennae large, slightly flattened, constricted about middle, indented at side of apex where the arista arises. Vertex triangular, base nearly as wide as length, angularly emarginate, keeled; sides keeled, keels meeting at apex; face very narrow, keels contiguous to apex, clypeus short, broad, rounded, without keels; labium very short; pronotum long, roundly, broadly and shallowly emarginate behind, with median carina; scutellum distinctly shorter than broad, lateral angles well behind middle, hind margin very broadly angular. Tegmina near to *Sikaiana*, but the median basal cell is very narrow and reaches to middle of tegmina or beyond, the median cross-vein parallel to media, and the subcostal cell is absent; wing very small, with stridulating surfaces on anal areas. In the male genitalia the dorsolateral margin of the pygophor extending as two large, broad spines, much longer than the genital styles.

I have taken the liberty of naming this genus after Dr. Leopold Melichar.

### (1) *L. rufovittata* sp. nov. (♂ ♀).

Head, thorax and abdomen bright red; legs, posterior edge of scutellum and post scutellum yellowish; tegmina vitreous; iridescent, costal, radial and median cells red, apical veins red, apical portion of tegmina black, continuing along media as narrow black mark to median cross-vein, a black mark at the forks of cubitus; wings red, very minute, not reaching to hind margin of second abdominal segment, triangular in shape, with large stridulating anal area. In this species the narrow median cell extends two-thirds from base of tegmen.

Length 2 mm.; tegmen 5 mm.

Habitat: Larat.

### (2) *L. fuscovittata* sp. nov. (♀).

Pl. III f. 12.

Head, antennae, scutellum, abdomen and anterior half of pronotum fuscous, posterior half of pronotum and the postscutellum yellowish, legs yellowish; tegmina hyaline, iridescent, a fuscous band from base, along costa, covering the costal, radial and median cells, and extending round to past the second cubital vein; apical veins red; wings fuscous, in shape and size as in *rufovittata*.

Length 2 mm.; tegmen 5 mm.

Habitat: Larat.

### *Zeugma* Westwood.

This has a neuration near to *Zoraida*, the cubitus having four veins and the media eight sectors, the first, furcate, sector being joined to cubitus, the cross-veins of cubitus and first two media sectors contiguous at end after which they are a short distance apart (gradate), subcosta and radia separate from a little before middle of tegmina, subcostal cell narrow, radia with five small branches in upper fourth of tegmina; the face and vertex forming one curve, broad and parallel sided; antennae pyriform, pointed end forming apex, and attached to head by the side and not by the center of larger basal end; subantennal process present, narrow, attached more behind than under antenna; pronotum long, shallowly and roundly emarginate behind, shoulder keels large and, together with subantennal processes, form distinct postantenal cavities. This is the only genus of this group which possesses subantennal processes and shoulder keels.

### *Z. monticola* sp. nov. Kirk.

[Head, pronotum, sterna and legs orange-yellow, the two latter more obscurely; a small spot at the base of the tegmina and another close to the hind angle of the mesonotum, blackish; labium, abdomen (mostly), basal and apical third in fore and of middle tibiae, apex of hind tibiae, third segment of tarsi, etc., more or less fuscous. Tegmina hyaline, tinged with cinereous, a fuscous line covering cubital and median cross veins, another over media and a third through subcostal cell to apex, a black line over apical cross veins.

Length 4.5 mm.; tegmen 9 mm.

Hab.: Parit Buntar (Malay Peninsula), Mowong and Pekalongan (Muir).

This may possibly be Westwood's *Z. vittata*, the locality of which is unknown, but he omits all mention of the conspicuous spots at the base of the tegmina and on the mesonotum; and the antennae are shaped quite differently, so much so, in fact, that if I did not think Westwood's description and figure of them (the antennae) erroneous, I should have founded a new genus on that character alone. G. W. K.]

The pygophor produced on ventral edge into a small median rounded projection, the side into a broadly triangular plate, with pointed apex reaching nearly to apex of genital style; anal tube large, slightly longer than genital styles, anus about one-third from base, apex angularly emarginate; genital styles long and narrow, slightly broader at base than at apex, apex with sharp point turned upward and inward. Hind margín of last abdominal plate of female evenly and widely emarginate in middle, the lateral portion of margin being slightly raised above median portion.

## *Zoraida* Kirk.

*Thracia* Westwood, preoc.

This genus apparently has four or five cubital veins, and four sectors to the media; the first sector, which has two branches, appearing as belonging to the cubitus.

### (1) *Zor. superba* sp. nov. (♂).

Antennae longer than face, cylindrical, sense organs small, light-colored. Posterior median edge of pygophor produced into small triangular plate, a little longer than width of base, sides produced into small angles, not half as long as genital style; anal tube very long, reaching beyond styles, anus about one-third from base, apex wide, deeply, angularly emarginate; basal fourth of genital styles narrow, apical three-fourths wider, convex outside, apex truncate with an inwardly curved spine on lower apical angle.

Head, thorax and abdomen reddish-brown, keels yellowish, pronotum and abdomen beset with small light-colored tubercles, legs and genital organs yellowish; tegmina uniformly brown except the narrow costal, subcostal and basal half of radial cells which are light yellow, veins reddish, the three veins entering truncate apex with a faint dark spot at base of the small whitish tips, cross veins slightly fuscous; wings reaching to first median sector, fuscous, reddish-veined.

Length 5 mm.; tegmen 13 mm.

Habitat: Laloki.

### (2) [*Zor. sylvicola* sp. nov. Kirk.

Head and appendages, sterna, sternites, and legs, orange-yellow, the fore and middle tibiae and tarsi more or less fuscous, except at the extreme base. Nota pale piceous, the pronotum and keels of mesonotum darker, the mesonotum paler, the elevated margin of the mesonotum, metanotal keels, etc., pale. Urotergites, pygophor, etc., black. Tegmina and wings hyaline; veins dark brown or black; costal, subcostal, radial, and median veins (but not the forks of the latter), suffusedly sooty, the suffusing broadening near the apical margin, so as to occupy nearly one-third of it. Some of the other veins are sometimes a little suffused. Pronotum scarcely granulate. Antennae cylindrical, sense organs medium sized, light colored.

Length 3 mm.; tegmen 11.5 mm.

Habitat: Telok Ayer (Muir). G. W. K.]

Ventral edge of pygophor angularly produced in middle, base of produced part narrower than length; sides broadly, angularly produced, the rounded apices reaching about the middle of anal tube; anal tube slightly longer than broad, anus near base, apex roundly truncate; styles not reaching to end of anal tube, ovately spatulate, slightly convex on upper side. Last abdominal ventral plate of female slightly wider than long, hind margin broadly, angularly produced from sides to middle; and tube about as broad as long, anus near base, sides convexly curved, apex deeply, angularly emarginate.

### (3) *Zor. pseudosylvicola* sp. nov. (♀).

Yellow, light on ventral side, inclining to brown on dorsal side, especially on abdomen. Tegmina hyaline, brown-veined, the tips of the four veins entering apical margin colorless, subcostal and radial cells brown. This is the same coloring as in *sylvicola* but lighter.

The median fourth of the posterior edge of last ventral plate produced into a broad, bluntly-pointed process, its width at base about half its length; anal tubes not reaching to end of styles, lanceolate, anus near base. The production on last segment and shape of anal tube separates this species from *sylvicola*.

Length 3 mm.; tegmen 11.5 mm.

Habitat: Telok Ayer.

### (4) [*Zor. insulicola* sp. nov. Kirk. (♂ ♀).

Head and nota brownish-testaceous, keels paler. Antennae, sterna (mostly), legs, etc., pale yellowish-testaceous; antennae cylindrical with closely set brown-ringed sensory organs. Pronotum with many pale granules. Mesonotum smudged with fuscous near the base. Abdomen brownish-testaceous, closely speckled above with purplish-brown or black. Tegmina with fine cubital veins, hyaline, so closely suffused with fuliginous that they have the aspect of being fuliginous, minutely spotted with hyaline (principally along the veins); apical half of costal parts clearer, nevertheless spotted with fuliginous; veins crimson. Wings hyaline, veins fuscous. Sometimes the tegmina are more or less maculate with black at the base, along the costal area, and apically.

Length 4.25 mm.; tegmen 10 mm.

Habitat: Amboina (Muir). G. W. K.]

Ventral edge of pygophor cordately produced in middle the pointed end apical, and, in lateral view, base swollen; sides very slightly and roundly produced; anal tube of medium length, anus behind middle, in dorsal view sides to anus parallel, then gradually tapering to pointed apex, which is curved downward, in lateral view of even width to turned down apical portion, which is thin; genital styles not quite as long as anal tube, narrow at base, the broader apical three-fourths with sinuous, parallel edges, apex rounded; last ventral abdominal plate of female longer than broad, moderately angularly produced from sides to middle; anal tube small, little longer than broad, anus near base, gradually narrowed to bluntly-pointed apex, beset with long hairs along edge.

### (5) *Zor. cydista* Distant.

A. M. N. H. (7) XIX 402.

Two females from Laloki which agree with the description; the white of postscutellum and dorso-central abdominal mark is due to waxy secretion. Antennae cylindrical with fine light-colored sense organs. Last ventral abdominal plate longer than broad, gradually and slightly produced in middle; anal tube reaching about half way along styles, little longer than broad, ovate in outline, anus near base, with a small process from middle of previous dorsal plate projecting over base.

One male from Amboina also agrees with these, but the yellow is more reddish, the markings on tegmina lighter and the antennae slightly longer and more slender. Ventral median edge of pygophor obtusely angularly produced, sides angularly produced as far as middle of anal tube, the ventral edge of angulation about twice the length of the dorsal edge; styles somewhat hatchet-shaped, base narrow, upper edge straight, apex broadly truncate, ventral edge deeply and roundly emarginate at base, with a deep cleft half-way along the broad apical part; anal tube reaching to end of styles, narrow, bluntly rounded at apex, anus about middle.

### (6) *Zor. fuliginosa,* sp. nov. ( ♀ ).

Antennae long, cylindrical, beset with small, light-colored sense organs. Length of anal segment about twice the width of the base, narrowed on distal half, apex roundly pointed, anus near base, a small truncate, median process from anterior dorsal plate projecting over base; last ventral abdominal plate slightly and evenly produced; the lateral portion of the anterior styles produced into an acute point. Fuliginous, pronotum and abdomen lightly irrorate, keels of head and scutellum and the legs yellowish tegmina fuliginous, dark-veined, except costa, distal half of subcosta, radia and apical tips of median veins, which are yellowish-white: three small white dots in basal half of costal cell, the apical half along with subcostal cell and tips of extreme apical cells white, a minute black dot near ends of radial and first three median veins, all the veins more or less irrorated with white spots along side; wings fuliginous, dark veined. This species comes near *Z. consanguinea* Distant.

Length 4 mm.; tegmen 10.8 mm.

Habitat: Laloki.

### (7) *Zor. lalokensis* sp. nov. ( ♀ )

Hind margin of last abdominal ventral plate exceedingly slightly and evenly produced (nearly truncate), plate longer than wide, a transverse depression two-thirds from base, the basal two-thirds convex in middle; a small round process projecting from last dorsal plate over base of anal tube; anal segment ovate, reaching half-way along styles, anus near base; antennae cylindrical, thickly beset with large sense organs. Stramineous, eyes brown, antenna brown, sense organs darker, legs slightly infuscate, ventral part of abdomen, especially the posterior plate, dark fuscous; tegmina and wings hyaline, brown-veined, costal, subcostal and radial cells fuscous yellow.

Length 4.4 mm.; tegmen 12.25 mm.

Habitat: Laloki.

### (8) *Zor. laratae* sp. nov. (♂ ♀ ?).

Medio-ventral edge of pygophor produced into small turbinate-shaped process; sides nearly straight; anal segment very long, narrow, with angularly emarginate apex, the apical third turned down, forming less than a right angle with basal two-thirds, anus in middle of basal, unbent portion; styles long and narrow, not quite reaching to bend in anal segment, irregularly spatulate, apex truncate and bent inward, a small conical projection near the base of the lower edge. Antennae long, slightly flattened, with small sense organs. Stramineous, brown eyes, abdominal segments with a few red spots on dorsum, slightly infuscate at base of scutellum; tegmina and wings hyaline, with fuscous yellow veins, costal, subcostal and basal portion of radial cells yellowish, the extreme tips of radial and first three median veins colorless with small spots where the color ceases, a dark mark covering cross-vein in radial cell near apex. I have a female from Amboina slightly lighter in color. In it the last abdominal plate is subtruncate (slightly convex); anal segment slightly longer than broad, broadly rounded at tip, with the anus at base.

Length 3 mm.; tegmen 9.5 mm.

Habitat: Larat; Amboina?

### (9) *Zor. javanica* Westwood (♂ ♀).

Medio-ventral edge of pygophor produced into a lanceolate process; sides truncate; anal segment very long, apex acutely pointed, apical third turned down at right angles to basal two-thirds, straight basal portion narrowest at base, with anus in its middle, genital style subspatulate, lower basal edge turned inward, formed into a two-lobed process, apex of right style subtruncate, with the upper corner produced into a long, curved spine, left style with apical spine small and apex more rounded. Antenna as long as head and thorax, cylindrical, thickly studded with small sense organs.

The female I associate with this male has the stramineous portion light salmon red and the fuscous portion much darker, the tegmina and veins also more fuscous. Hind margin of last abdominal segment broader than long; anal segment broadest slightly beyond base, pointed at apex, sides curved, anus near base, the previous segment being produced in middle over the base of anal tube into a small rounded process. Two specimens from Roban, Java.

### *Peggiopsis* gen. nov.

Type *rufus.*

Antennae longer than head and thorax together, flat, upper edge of apex slightly emarginate where seta situated, narrowed at base, margins thicker than disk; vertex and face perceptibly below the level of the eyes, which are round and bulging; clypeus longer than face, narrow, tricarinate. Pronotum and scutellum as in *Zoraida,* the scutellum being distinctly tricarinate. Cubitus furcate, media with five sectors, the first furcate and joined to the cubitus, its base appearing as median cross-vein. Hind tibiae with a minute basal, large sub-apical and one large and three small apical spines. This genus appears to be very near to *Peggia* Kirk. (*Nebrissa* Stal), but the round bulging eyes, sunken face and the distinct tricarinate scutellum distinctly separates it.

### (1) *P. rufa* sp. nov. (♂ ♀).

Light red, eyes and tips of genital styles black; tegmina and wings hyaline with reddish-brown veins, costal and lower portion of radial cells yellowish, the narrow subcostal cell fuscous. Ventro-median edge of pygophor produced into a truncate-tipped process, the base nearly twice as broad as tip, the sides slightly sinuous, the base in profile gibbous; anal segment as long as styles, subspatulate, the base being constricted below anus; genital styles very narrow at base, gradually widening to the nearly truncate apex, the upper corner of which is produced into a small rounded process which is turned inward, near the base of upper edge there is a small spine.

Female with last abdominal plate longer than broad, hind margin broadly, angularly produced; between the plate and the genital styles there projects a small conical-shaped plate; anal segment nearly as wide as long, ovate in outline, with a small emargination at apex, anus situated at base. The one female specimen from Amboina has a much deeper emargination at apex of anal segment, and the small ventral plate between last segment and styles is more pointed. I expect the male will show it to be a distinct species.

Length 3.6 mm.; tegmen 9.8 mm.

Habitat: Piroe, Amboina.

## *Proutista* Kirkaldy.

[Mr. Distant has persisted in synonymizing this with *Phenice*, but the two are different. In *Proutista* the clypeus is distinctly longer than the frons; while in *Phenice* the frons is longer than the clypeus, or, at least, not shorter; and the venation of the wing is much simpler in the Aethiopian genus than in the Australasio-Oriental one. Formerly I was willing to adopt Mr. Distant's views, as I have never seen a *Phenice*, and it was possible that the figures of Boheman and Westwood might be somewhat inaccurate, but Mr. Distant's own figures, in the "Fauna of India" and "Insecta Transvaaliensia," drawn by the same careful artist in each case, of "*Phenice moesta*" and of "*Phenice abdominalis*," show that I was justified in my original contention that *Proutista* is not a synonym of *Phenice*. G. W. K.]

Until I can examine African specimens of *Phenice* I shall retain the genus *Proutista*. It is very distinct from allied genera (excluding *Phenice* which I have not examined) in the reduction of the female genital styles, which are represented by minute tubercles. In this genus the cubitus has two branches and the media five or six simple sectors, the median cross-vein being near base of first sector so that the cubitus appears as three veined and the media to have but four sectors.* Hind tibiae without basal and submedian spine. There is a large group of species of similar facies to *moesta* and *lumholtzi* which will only be finally straightened out by a study of the genitalia. Some of the following species may prove to be synonymous, but I must leave it to those who have the original types to describe or figure the genital organs.

### (1) *P. lumholtzi* Kirk.

A. S. E. Belg. (1907) LI 126.

Medio-ventral edge of pygophor produced into a parallelogramical process, longer than broad, the sides and apex being slightly concave, in profile the base projecting; lateral edges slightly rounded ;anal segment long, bent downward at rightangles before the middle, the basal, straight portion subparallelsided, length about three times the breadth, anus one-third from base, the distal bent portion forming a long, finely-pointed spine; styles projecting to bend in anal segment, breadth slightly more than half the length, margins rounded, apex produced into a finely-pointed, inwardly-turned spine, on upper margin near base there is another small spine. Last abdominal plate of female in profile excavate in middle, the medio-basal portion produced into strong, short spine, the posterior edge produced regularly in middle.

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* Westwood's figure of *Phenice fasciolata* shows five median sectors, the first furcate; the costa, subcosta and general shape of tegmina also differ in these two genera.

Habitat: Queensland and Amboina, on sugar-cane.

### (2) *P. gemina* sp. nov. (♂).

Similar in markings to *lumholtzi*, the dark markings on tegmina slightly more expansive. Anal segment very small, length about twice the breadth, basal two-thirds parallelsided, then pointed, anus situated in distal third; ventral edge of pygophor truncate; styles reaching slightly beyond anal segment, irregularly diamond-shaped, the broadest part nearest the base, apex forming a small inwardly-curved point. The genitalia differs so greatly from *lumholtzi* that there can be no confusion between them.

Length 2.3 mm.; tegmen 6 mm.

### (3) *P. koebelei* sp. nov. (♂).

This has the same markings and general appearance as *gemina*, but the genitalia is very distinct.

Ventral edge of pygophor truncate; lateral edges between style and anal segment produced into triangular plates (subequilateral); anal segment small, projecting very slightly beyond apices of lateral triangular edges, cylindrical, anus situated at apex; styles slightly longer than broad, broadly rounded at apex, upper edge irregularly produced, a small spine on lower edge of apex.

Length 2.5 mm.; tegmen 6 mm.

Habitat: Queensland. Coll. Koebele No. 2270.

I take the pleasure of naming this species after Mr. A. Koebele.

### (4) *P. moesta* Westw.

Specimens from Malay Peninsula, Java, Pontianak, Makassar and Amboina agree with the description of this species. The male genitalia are identical in all these specimens. Ventral edge of pygophor truncate, lateral edges slightly curved; anal segment long, bent at less than a rightangle a little beyond middle, straight basal portion with curved sides, broadest about middle, where ânus is situated, bent portion narrow, pointed; style reaching to bend in anal segment, length a little more than twice the breadth, edges subparallel, apex drawn out in fine point which is turned inwards, the upper edge near base produced into a small angular process.

### (5) *P. javensis* sp. nov. ( ♂ ♀ ).

Yellowish-brown; antennae, keels on face and clypeus, middle of pronotum and scutellum, legs and genitalia lighter yellow; tegmina hyaline with yellowish veins, fuscous brown over subcostal and radial cells, four or five small dark marks through costal cell, bases of cubitus and radial sectors fuscous, fuscous over median cell, extending into clavus, a dark mark at apex of cubital veins and at end of each radial sectors, fuscous on each side of gradate cross-veins of media; wings hyaline with fuscous markings over veins. Ventral and lateral edges of pygophor truncate; anal segment about as long as styles, the apical third turned down at right angles to basal portion, which is about twice as long as broad, with the anus about the middle, the apical third narrow, pointed at apex; styles projecting about one-fourth beyond bend of anal tube, narrow, edges subparallel at base, narrowing toward the blunt, round apex, the apical third being cylindrical. Last ventral abdominal plate of female short, a deep, longitudinal depression down the middle, the posterior edges forming two crescent-shaped ridges below the very small genital styles, anal segment minute.

Length 2.5 mm.; tegmen 7 mm.

Habitat: Java.

### (6) *P. perkinsi* sp. nov. ( ♀ ).

Light brown; face, middle and lateral edges of pronotum, median line on scutellum and sides of abdomen light yellow, dark dorsal portion of abdomen spotted with light yellow, labium and tarsi dark brown; tegmina subhyaline, costa, subcosta and base of media and cubital veins yellowish, rest brown, subcostal and radial cells light fuscous brown, extending at base into clavus, also over apical half of cubitus, tips of median sectors and gradate median cross-veins bordered with fuscous; last ventral abdominal plate angularly produced, apex deeply but narrowly emarginate, deeply, longitudinally depressed along middle and sides, leaving two keels between the depressions, anal segment and genital styles excessively small.

Length 2.7 mm.; tegmen 7.7 mm.

Habitat: Queensland. Coll. Messrs. Perkins and Koebele.

I take the pleasure of naming this insect after Dr. R. C. L. Perkins.

### (7) [*P. calypso* sp. nov. Kirk. ( ♂ ♀ ).

Pale luteous, more or less suffused with orange; beneath testaceous; sterna and abdomen basally more or less suffused with orange; antennae, labium and legs testaceous; labium and fourth segment of labium, etc., black: apex of hind tibiae, second and third segments of the tarsi, dark fuscous. Tegmina hyaline; radial and median veins, and veins on basal third testaceous, rest fuscous, spotted with fuscous. Wings hyaline, veins fuscous.

Length 2.7 mm.; tegmen 6.3 mm..

Habitat: Larat (Muir). G. W. K.]

Medio-ventral edge of pygophor produced into small angular process, about twice as long as the base is broad; lateral edges rounded; anal segment medium size, constricted slightly before middle, anus situated in middle, bluntly rounded on apex; styles large, in lateral view somewhat boatshaped, the upper edge being nearly straight and produced into a rounded point, the bottom edge rounded, curving up to point, the inner edge of the rounded point being drawn out into a short sharp inwardly turned point. Anal tube of female very small, genital area below tube large and swollen, embossed across middle, genital style exceedingly small, lateral edges of last abdominal segment straight, ventral plate depressed along the middle near posterior border, the edges of the depression slightly projecting behind. In this species the first median sector approaches the cubitus and appears as if belonging to that system, the median cross-vein being very small.

### (8) *P. straminea* sp. nov. (♀).

Stramineous; tarsi and tip of labium fuscous, dorso-lateral portion of abdomen brown, spotted with lighter dots; tegmina and wings subhyaline, veins dark brown. Basal median portion of last abdominal ventral plate produced into a blunt point, posterior edge into two flattened processes; lateral edge of last segment produced into a small triangular piece. The two median processes on the last ventral plate are very distinctive.

Length 3 mm.; tegmen 5.8 mm.

Habitat: Laloki.

### (9) *P. lurida* sp. nov. (♀).

Stramineous; tips of clypeus, labium, tarsi and hind tibiae fuscous, abdominal segments slightly fuscous; tegmina subhyaline, covered with waxy secretion, veins yellowish, cross-veins fuscous, several narrow brown marks through costal cell, apices of veins fuscous, which slightly extends into the cells; wings subhyaline with brown veins; lateral margins of last abdominal segment produced into a flattened spine with a rounded apex, reaching to end of genital segment; ventral edge not produced.

Length 3 mm.; tegmen 7.7 mm.

Habitat: Laloki.

The approximation of the first median sector to the cubital system is very conspicuous in this species.

### (10) *P. lutea* sp. nov. ( ♂ ).

Stramineous, dorso-lateral reddish marks down pronotum and scutellum and on pleurae, clypeus and labium fuscous, median keel on clypeus and facial keels yellowish, sides of abdomen fuscous; tegmina light fuscous brown with a broad hyaline patch down apical half, gradate median cross-veins fuscous, small marginal white marks between veins; wings fuscous, yellowish-veined, fuscous cross-veins. Ventral edge of pygophor produced into a small, median, spatulate process; lateral edges sinuous, produced into a small triangular plate beside anal segment; anal segment long, narrow, basal half parallel-sided, apical half thinning to fine point, anus about a third from base; styles reaching to end of anal segment, widened on upper basal half, gradually thinning to fine point at apex which is turned inward.

Length 3 mm.: tegmen 7.7 mm.

Habitat: Laloki.

## *Paraproutista* gen. nov.

Type *ceramensis.*

This genus differs from *Proutista* in the neuration of the tegmina, the cubitus being two branched and the media having six sectors, the third being furcate, the first three angular near their bases, the first one appearing to belong to the cubitus. Hind tibiae with basal, submedian and apical spine, also several smaller apical spines. Female genital styles exceedingly small.

### (1) *Par. ceramensis* sp. nov. ( ♂ ♀ ).

Pl. III f. 2.

Dark brown; keels on face, antenna, legs, lateral edges and middle of pronotum, keels and posterior edge of scutellum yellowish, a few yellowish spots on abdomen; tips of labium, tarsi and tibiae fuscous; tegmina hyaline greatly suffused with fuscous, veins brown, the subcostal, radial and median cells fuscous, extending across middle of cubitus and fourth and fifth median sectors to posterior border, cubital veins and median sectors irregularly bordered and spotted with fuscous, dark marks in costal cell breaking it up into spots.

Anal segment very small, rounded, shorter than the width of the base, anus at apex; lateral edges of pygophor produced angularly; ventral edge broadly angular; styles attached well within pygopher, little longer than broad, rounded along lower edge and at apex, a small depression along upper edge, with a small angular projection pointing outward near apex. Genital area of female flattened, anal tube very small, styles abortive.

Length: 8 mm.; tegmen 9 mm.
Habitat: Piroe; Laloki.

(2) [*Par. ismene* sp. nov. (Kirk.).

Brownish-yellow; clypeus, labium, pronotum (except down the middle), abdomen in part, brownish piceous; frons, antennae, legs, testaceous; apex of hind tibiae, second and third segments of tarsi, darker blackish. Tegmina dark fuliginous, veins bright sanguineous, hyaline spots all along the costal area on the clavus and along the inferior margin. Wings fuliginous, veins dark fuscous with hyaline spots; hind margin of mesonotum and urotergites basally in part clear luteous. The head-keels are fairly separated basally; third segment of labium short; pronotum not, or scarcely, granulate. Mesonotum greatly declivous, carinae distinct. Abdomen variable beneath, sometimes sanguineous.

Length 3 mm.; tegmen 7.7 mm.
Habitat: Borneo, Moewong (Muir). G. W. K.]

This species stood under *Proutista* in Kirkaldy's manuscript. Ventral edge of pygophor truncate, with a small conical elevation at each corner; lateral edges slightly and roundly produced; anal segment long, anus situated in basal third, which is parallel-sided, apical two-thirds narrow, cylindrical, pointed; length of styles about twice the breadth, straight on the lower edge, bluntly pointed at apex, the basal part of upper edge produced at right angles to main portion. Last abdominal ventral plate of female longer than broad, hind margin produced in middle into angular projection, reaching well beyond end of body, in profile concave in middle, base globose; anal segment very small; styles abortive.

(3) [*Par. antigone* sp. nov. (♂) Kirk.

Castaneous, the keels and the pronotum medially yellower, the clypeus and the abdomen more or less suffused with sanguineous. Pronotum laterally more or less olivaceous, with pale yellowish granules. Antennae, sterna and legs testaceous, leg spines tipped with black, but the tarsi are scarcely at all fuscous; labium and fourth segment of labium fuscous. Tegmina dark fuliginous, bluish-brown basally; costal, subcostal, radial, and median veins, almost entirely dark sanguineous, other veins dark fuscous, in places bluish-black, a few scattered hyaline spots. Hind tibiae with two distinct spines, one at the base. Wings fuliginous, veins black. Clypeal keels very distinct.

Length 3.8 mm.; tegmen 9.0 mm.

Habitat: Telok Ayer (Muir). G. W. K.]

This species stood under *Proutista* in Kirkaldy's manuscript.

Ventral edge of pygophor truncate; lateral edge sinuous, produced into small triangular plate beside the anal segment; anal segment broad on basal two-thirds, the apical third tapering to fine point, anus about middle; styles nearly square, not reaching to apex of anal segment, lower edge straight, apical edge slightly concave, upper edge produced into a large curved process on basal half.

### (4) *Par. media* sp. nov. (♂).

Pl. III f. 1.

Light brown; legs, labium and antennae yellowish, pronotum and abdomen with many small yellowish granules; tegmina hyaline, costa, subcosta and radia red, cubitus and median sectors brown; costal, subcostal and radial cells fuscous, costal having a series of white spots, radial with three large ones in upper half, fusciness spreading over apex to tip of fifth median sector; wings hyaline, reddish-brown veins, basally fuscous. Anal segment long, tapering to a point, anus one-third from base; lateral edges of pygophor slightly and roundly produced; ventral edge truncate; styles broadly angular, not reaching to apex of anal segment, lower edge straight, upper edge sinuous, the apex produced into an inwardly-curved spine.

The neuration of this species is of interest, and is perhaps of generic value; the angulation at the base of the first three sectors is very acute and sends a spur backward to join the preceding one, this causes the cubital to appear six-veined, the media to have but three sectors, and as if there were four cross-veins between the median and cubital systems.

Length 4.6 mm.; tegmen 9 mm.

Habitat: Piroe.

### (5) *Par. coccineovenosa* sp. nov. (♂ ♀).

Clypeus crimson with fuscous apex, head and thorax brownish-yellow, the legs, keels of face and scutellum and antennae lighter, abdomen crimson; tegmina and wings pale brown with crimson veins, a series of white spots along costal margin, reaching to first median vein. Ventral edge of pygophor truncate; sides narrowly and angularly produced, the apex reaching about middle of anal tube; length of anal segment about three times the width of base, subparallel-sided to near the pointed apex, anus situated in middle; styles as long as the anal segment, the lower edge sinuously rounded on basal half, then concavely curved to the inwardly-turned apex, the upper edge rounded on basal half, then convexly curved to inturned apex. Female styles abortive, a small triangular plate on each side of the minute anal segment.

Length 3 mm.; tegmen 7.3 mm.

Habitat: Malay Peninsula.

### *Diostrombus* Uhler.

Proc. Nat. Mus. U. S. 1896, p. 283.

*Drona*. Distant. Faun. Brit. India. Rhynchota III p. 305.

Through the kindness of the authorities of the National Museum, Washington, I have been able to examine a female cotype of this genus, and cannot separate it from Distant's *Drona*. The figure of *D. carnosa* (Fauna British India, Fig. 146) I believe to be of a female, and the description of the type of *Diostrombus* appears to be from a female; the male is not likely to possess the forceps-like processes arising from the posterior edge of the pregenital ventral plate.

### (1) *D. pennatus* Distant.

Faun. Brit.. India. Rhynchota III p. 306.

I have one female specimen from Java that agrees in all the specific characters with this species; the keels on vertex and face are not nearly so well defined as in *carnosus* or *politus*, and the "forceps" on last ventral plate are much smaller than in the type species.

### GROUP IV.

1. Radial and median basal cells subequal in length, ending same distance from base of tegmen................ 2
   Radial and median basal cells not ending same distance from base of tegmen, unequal in length............ 6
2. Face strongly carinate along middle ........*Phaconeura*
   Face not carinate along middle..................... 3
3. Lateral margins of face convex..................*Suva*
   Lateral margins of face not convex.................. 4

4. 7 (or 9)* medio-cubito-apical veins .................... 5
5 (or 7)* medio-cubito-apical veins . ............... *Nisia*
5. Face not very narrow,, parallel-sided ........... **Kermesia*
Face very narrow, widening at apex ............... **Alara*
6. Veins of cubitus running straight to hind margin ...... 7
Veins of cubitus irregular, forming one or more angular cells, sometimes in conjunction with first median sector ............................................. 8
7. Cubitus 3-4 veined ............................ *Mysidia*
Cubitus 10-11 veined ............................ *Derbe*
8. Lateral keels of face contiguous to near apex .......... 10
Lateral keels of face not contiguous, face not linear .... 9
9. Vertex narrow, about twice as long as broad; in dorsal view keels of face projecting about half the length of eyes ...................................... *Dichotropis*
Vertex as long as broad; in dorsal view keels of face projecting about the length of eyes ............. *Decora**
10. No triangular cell at base of first median sector (or radial cross-vein) ...................................... 12
Triangular cell present at base of first median sector (or radial cross-vein) ................................ 11
11. Shoulder keels well developed ...................... *Levu*
Shoulder keels not developed ......... *Rhotana, Genestia**
12. Face longer than clypeus, eyes reaching below middle of genae . ............................... *Sumangala**
Face not longer than clypeus, eyes confined to upper portion of genae ....................... *Mecynorhynchus*

### *Nisia* Melichar.

### *N. atrovenosa* Leth.

There are specimens from Borneo and Piroe which I cannot separate from this species. I am unable to separate this genericly from *Mecnoplus albosignatus.*

### *Suva* Kirkaldy.

Text figures 3 and 3a in H. S. P. A. Ent. Bull. III p. 166 are of *S. koebelei* Kirk., not *Phaciocephalus;* it has one more apical vein than *Nisia.*

### *Phaconeura* Kirkaldy.

### (1) *P. laratica* sp. nov. (♂ ♀).

Dirty yellow, abdomen, including genital styles, dark fuscous; tegmina hyaline, broadly bordered with fuscous, the fusciness being chiefly along second clavial vein, over all the cubital and costal cells, and over all apical veins, leaving the media veins and center of tegmina clearer. Median ocellus present, although small and difficult to see in some specimens.

---

* Depends upon whether the first forked vein be considered as radial or median.

Length of body 2 mm.; tegmen 2.7 mm.

Habitat: Larat.

There is a single specimen of female in which there is no fusciness on tegmina and which differs slightly in the pregenital segment.

### *Mecynorhynchus* nov. gen.

Type *kershawi.*

Head in profile semicircular, eye in upper half near to vertex, gena in front of eye narrow, below eye broad. Antennae cylindrical, about twice as long as broad, situated on lower part of gena; subantennal processes large, from apex of facial keels to back of gena. Vertex very small, acutely angular, angularly emarginate at base, sides with keels which meet at apex; face very narrow from base to well below eyes, then widening to junction with subantennal processes, thence slightly narrowing to apex, keels large, contiguous to well below eyes; clypeus very long and pointed, the apex reaching third coxae, lateral carinae large, median obscure; labium long, reaching to end of abdomen, distal joint minute; pronotum very short, vertical in middle and fitting into emargination of vertex, hind margin acutely angularly emarginate in middle, shoulder keels large; scutellum broader than long, anterior margin rounded, the rounded lateral angles about middle, posterior median portion angular, without carinae, but a pair of slight grooves run down the anterior third. Tegmina fairly broad, the neuration differs from *Rhotana* in having the subcostal and radial cells longer and broader, the costa evenly curved, not sinuate, the absence of the small triangular cell at the base of first median sector.

### *M. kershawi* sp. nov. (♂).

Pls. II f.f. 1-1a, Pl. III f. 10.

Head and legs stramineous, vertex and face tinged with claret red, eyes brown, pronotum and scutellum fuscous claret, tegmina fuscous, red along costa, veins darker, red at apex. Male genital styles very short, spatulate.

Length of body 2 mm.; tegmen 3.4 mm.

Habitat: Mowong.

I take the pleasure of naming this pretty little insect after my friend Mr. J. C. Kershaw.

### *Rhotana* Walker.

J. Linn. Soc. Zool. I 160.

### *R. latipennis* Walker.

My specimens from Teloc Ayer agree both with Walker's short description and his figures. Shoulder keels slightly developed; subantennal processes large, stretching from the apex of the facial keels, of which they appear to be continuations, to back of gena. *Rhotana vitriceps* Stal does not appear to be congeneric with *latipennis*.

### *Genestia* Stal.

Ofr. Vet. Akad. Forh. XV p. 450 (1858).

The type of this genus, *vitriceps,* cannot be placed in *Rhotana,* but as I only know it by the description and Melichar's figure I cannot separate it with certainty. The neuration of the tegmina, as shown in Melichar's figure, differs considerably from *R. latipennis* Walk.

### *Dichotropis* gen. nov.

Type *amboinensis*.

In profile vertex and face curved, without angulation where they meet; gena in front of eye about half the width of eye, eye about twice as broad as deep, shallowly emarginate on lower border; subantennal process large, the base stretching from facial keels to back of gena; antennae small, barely reaching to eyes, pyriform, the narrow end apical. Vertex small, not reaching to anterior margin of eye, about twice as long as broad, base very slightly broader than apex, acutely angularly emarginate, without keel, sides straight, slightly converging toward apex, keeled, a transverse keel dividing apex from face; face gradually broadening from base to about one-fourth from apex, where the sides are angular and slightly narrowed to apex, lateral keels deep; clypeus about as long as face, distinctly tricarinate, lateral carinae continuous with lateral facial keels. Pronotum very short, hind margin angularly emarginate in middle, shoulder keels large. Scutellum as long as broad, lateral angles slightly before middle, tricarinate. Tegmina having wider radial cell than *Rhotana,* practically the same as *Levu*.

This genus is near to *Decora* Bierm.

### (1) *D. amboinensis* sp. nov. ( ♂ ♀ ).

Pls. I f. 20, III f. 6.

Stramineous, abdomen slightly fuscous; tegmina and wings hyaline, slightly opaque with waxy secretion, veins yellowish, a fuscous mark on hind margin a little beyond clavus.

Length of body 2.3 mm.; tegmen 4 mm.

Habitat: Amboina ( ♂ ♀ ), Larat ( ♂ ) and Laloki ( ♀ ).

### (2) *D. chrysonoe* Kirkaldy.

*Rhotana chrysonoe* Kirk. H. S. P. A. Ent. Bull. I, 435.

### (3) *D. haematoneura* Kirkaldy.

*Rhotano haematoneura* Kirk. H. S. P. A. Ent. Bull. I, 435.

## *Levu* Kirk.

H. S. P. A. Ent. Bull. I, 434.

Walker's error in numbering the figures on his plate caused Kirkaldy to refer this to *Paricana;* it is related to *Rhotana,* from which it differs in the shorter pronotum, angularly emarginate behind, and the greater development of the shoulder keels, characters which I do not think will hold good with the increase of specific forms.

### (1) *L. vitiensis* Kirkaldy.

### (2) *L. halosydney* (Kirkaldy).

*Rhotana halosydne* Kirk. H. S. P. A. Ent. Bull. III, 169. This is typical of *Levu* and if the genus is retained must be placed therein.

### (3) *L. amboinensis* sp. nov. ( ♀ ).

Stramineous, eyes castaneous; tergmina and wings byaline, subopaque with waxy secretion, veins yellowish; tegmina with fuscous mark from media to cubitus across median cross vein, and another a little beyond to hind margin, a small dark spot at apical fork of radia and media. The structure of head and thorax and neuration of tegmina is typical of genus.

Length of body 2 mm.; tegmen 3.5 mm.

Habitat: Amboina.

### (4) *L. sufflava* sp. nov. ( ♀ ).

Yellowish, reddish along keels of face; tegmina hyaline, subopaque with waxy secretion. veins on basal half white, on apical half slightly infuscate, a black mark at apical fork of media. The emargination of pronotum is not so deep or so angular as in the type and the branch of cubitus is missing.

Length of body 2.2 mm.; tegmen 4.6 mm.

Habitat: Mowong.

### (5) *L. rubra* sp. n. (♀).

This differs from the type in having the vertex slightly flattened, the junction of face and vertex being angular; the pronotum is less angularly and deeply emarginate behind and the tegmina differ in the cubital veins.

Red; the legs and tip of abdomen somewhat paler; tegmina hyaline, red-veined, slightly fuscous along clavus veins; wings hyaline, reddish-veined.

Length of body 2 mm.; tegmen 3.5 mm.

Habitat: Amboina.

### (6) *L. laratica* sp. nov. (♂ ♀).

In structure of head and neuration of tegmina this agrees with *rubra*.

Stramineous; keels on face and a spot on gena in front of eye red; tegmina hyaline, veins yellowish, cells besides veins infuscate, especially the transverse veins from radia to cubitus.

Length of body 1.5 mm.; tegmen 3 mm.

Habitat: Larat.

## DESCRIPTION OF PLATES.

### PLATE I.

1. *Thyrocephalus flavomaculatus,* lateral view of pygophor.
2. “ *pseudolaratensis,* “ “ “ “
3. “ *laratensis,* “ “ “ “
4. “ *leucopterus,* external view of left genital style.
5. “ *pseudotypicus,* external view of left genital style.
6. “ *obscurus,* external view of left genital style.
7. *Vekunta hyalina,* internal view of left genital style.
8. *Phantasmatocera pseudonigricornis,* ventral view of last abdominal segment of ♀.
9. “ *nigricornis,* ventral view of last abdominal segment of ♀.
10. “ *arborea,* ventral view of last abdominal segment of ♀.
11. “ *laratensis,* ventral view of last abdominal segment of ♀.
12. “ *unopunctata,* ventral view of last abdominal segment of ♀.
13. “ *pallidocornis,* ventral view of last abdominal segment of ♀.
14. “ *pseudopallidocornis,* ventral view of last abdominal segment of ♀.
15. “ *vitiensis,* ventral view of last abdominal segment of ♀.
16. “ *papuana,* ventral view of last abdominal segment of ♀..
17. “ *lalokensis,* ventral view of last abdominal segment of ♀.
18. *Eosaccharissa laratica,* lateral view of head.
19. *Swezeyia laratica,* dorsal view of head and thorax.

19a. “ “ lateral “ “ “ “ “

20. *Dichotropis amboinensis,* front view of head.
21. *Goneokara pullum,* tegmen.
22. *Phaciocephalus miltodias,* tegmen.
23. *Basileocephalus thaumatonotus,* tegmen.
24. *Thyrocephalus laratensis,* tegmen.
25. *Cyclometopum amboinensis,* tegmen.

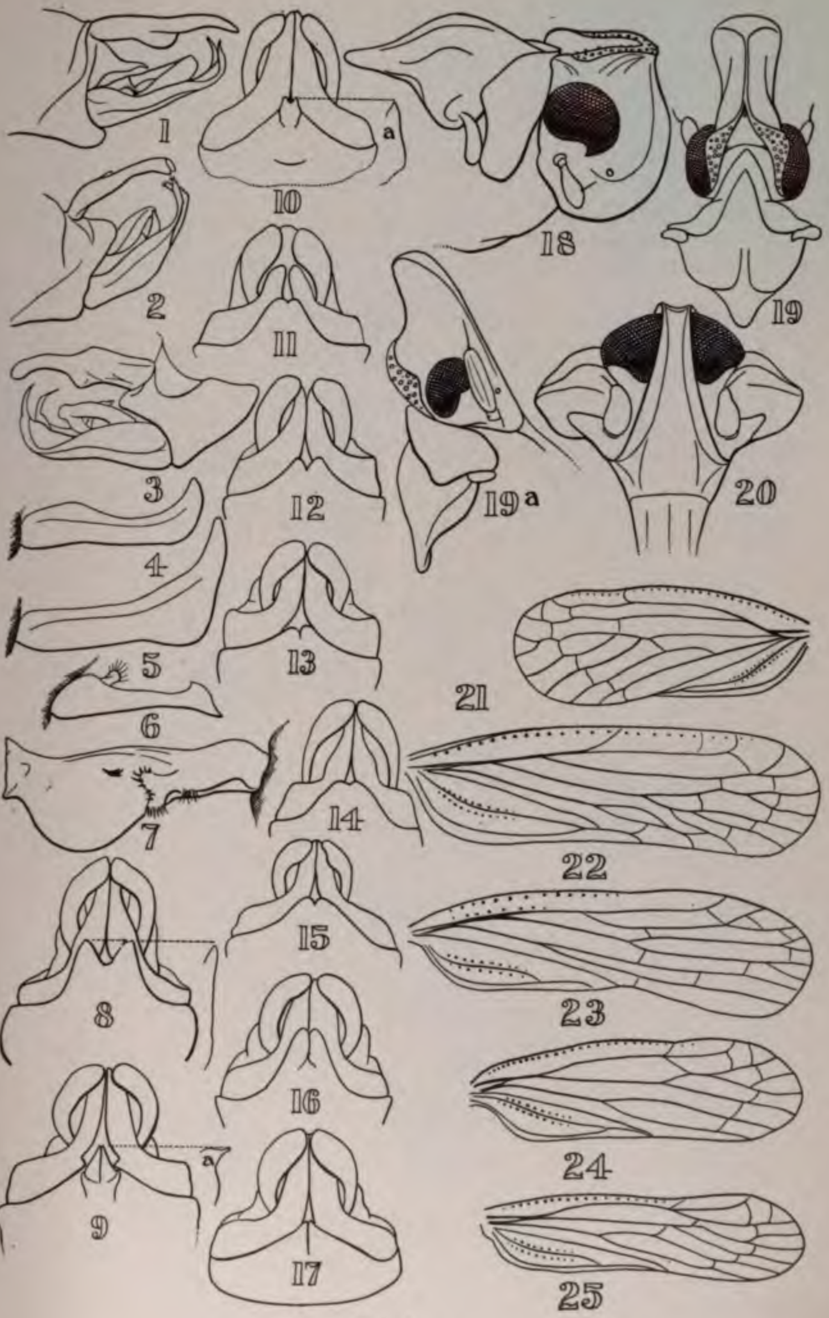


Plate I.

## PLATE II.

1. *Mecynorhynchus kershawi,* front view of head.
1a. " " lateral " " "
2. *Megatropis coccineolinea,* " " " "
3. *Neocyclometopum sordidum,* " " " "
4. *Kampulokara caenosum,* front view of head.
4a. " " lateral " " "
5. *Leptaleocera coccinea,* " " " "
6. *Goneokara pullum,* " " " "
7. *Nesokara piroensis,* " " " "
8. *Eocenchrea maorica,* front view of head.
9. *Platocera annulipes,* lateral " " "
10. *Paralyricen jepsoni,* " " " "
11. *Kaha media,* " " " "
12. *Cyclometopum amboinensis,* lateral view of head.
13. *Cyclokara girdlestoni,* " " " "

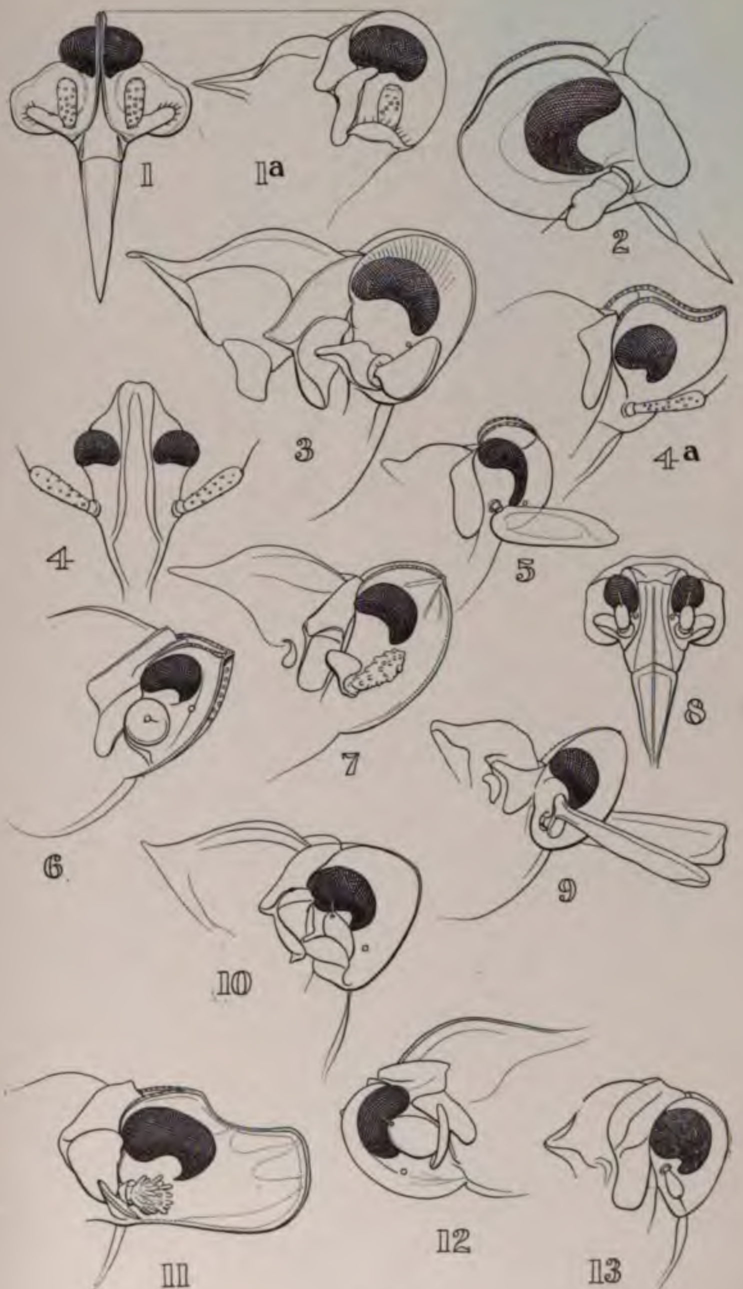
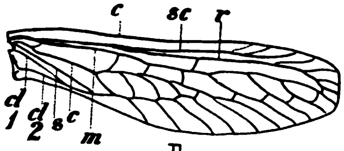


Plate II.

## PLATE III.

1. *Paraproutista media,* tegmen.
2. " *ceramensis,* tegmen.
3. *Platocera annulipes* "
4. *Cyclokara girdlestoni.* "
5. *Pyrrhoneura immaculata,* "
6. *Dichotropis amboinensis,* "
7. *Kampulokara caenosum,* "
8. *Eocenchrea maorica,* "
9. *Paralyricen jepsoni,* "
10. *Mecynorhynchus kershawi,* "
11. *Swezeyia laratica,* "
12. *Leomelicharia fuscovittata* "
13. *Nesokaha piroensis,* "
14. *Megatropis coccineolinea,* "
15. *Leptaleocera coccinea,* "
16.. *Phaciocephalus pullatus,* "



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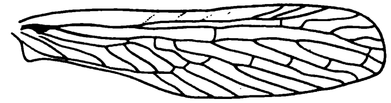

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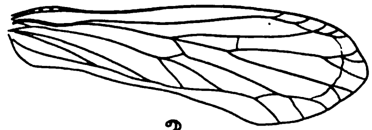

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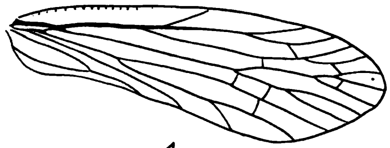

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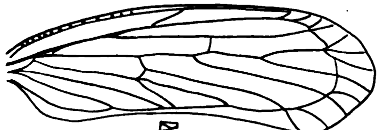

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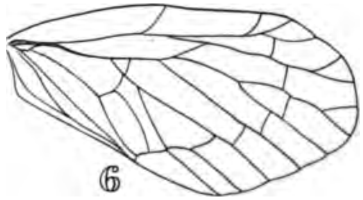

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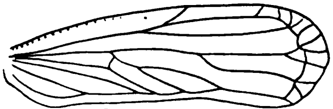

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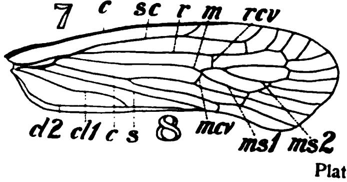

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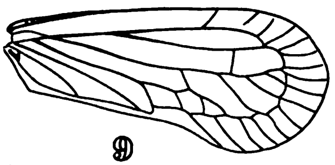

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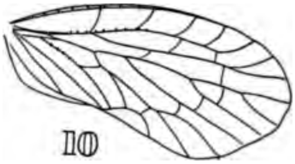

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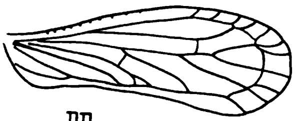

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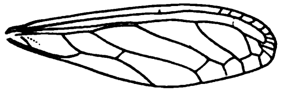

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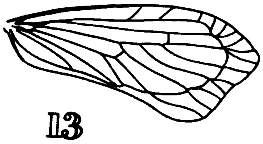

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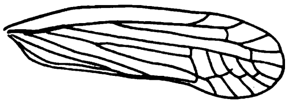

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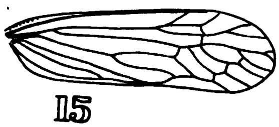

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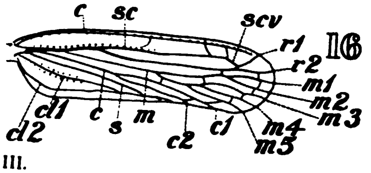

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Plate III.

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DIVISION OF ENTOMOLOGY

BULLETIN NO. III

REPORT OF WORK
OF THE
# EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

# Leaf-Hoppers—Supplement

## *(HEMIPTERA)*

BY G. W. KIRKALDY

HONOLULU, H. T.
SEPTEMBER 2, 1907

595
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DIVISION OF ENTOMOLOGY BULLETIN No. 1

REPORT OF WORK
OF THE
# EXPERIMENT STATION
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HAWAIIAN SUGAR PLANTERS' ASSOCIATION

# Leaf-Hoppers—Supplement
*(HEMIPTERA)*

By G. W. KIRKALDY

HONOLULU, H. T.
SEPTEMBER, 1907

# LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the Hawaiian Sugar
Planters' Association, Honolulu, T. H.

Gentlemen:—I, herewith, submit for publication Bulletin III of the Division of Entomology. This has been prepared by Mr. G. W. Kirkaldy, and is supplementary to and completes Bulletin I.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

Honolulu, T. H., April 29th, 1907.

# ADDENDA.

P. 11: *Tartessus iphis* sp. n.
*Vulturnus vaecors* sp. n.
P. 12: *Siphanta sensilis* sp. n.
*Nesopompe* (subg. n. of *Cixius*).
*Nesochlamys* g. n.
*N. vitiensis* sp. n.
P. 13: A number of spp. of "Delphax" have been misplaced, also *"P" dilpa* should be *"D."*

# INTRODUCTION.

In the present memoir, the determination and description of the Leafhoppers collected by Prof. Koebele and Dr. Perkins, and partially discussed in the ninth part of Bulletin I, are now completed,— together with those found by Mr. Muir in the Fiji Isles, as well as two interesting forms from China.

In the former contribution, 85 genera and 212 species were erected as new, while 58 genera (and subgenera), and 175 species (and varieties) are now added, a total of 143 genera and 387 species, making a considerable increase in our knowledge of Australo-Fijian Leafhoppers, as almost all of the new forms are from these countries. At the same time, it must be insisted that these form but a small proportion of the total Leafhopper Fauna of the Countries mentioned.

The Australasian (*) Region seems to embrace four subregions:

1. The AUSTROMALAYAN (or Papuan), including that of the same name of Wallace, but extending to include the tropical forest of Queensland, New Caledonia and adjacent islands as far as the Fijian Archipelago.
2. The EURONOTIAN (or Bassian), including the Southeastern third of Australia and Tasmania.
3. The MAORIAN, including New Zealand and adjacent islands.
4. The WESTRALIAN, or West Australia.

Nothing is known of the indigenous Hemiptera of Tahiti, Samoa, the Tuamotus, &c., but they are probably a mixture of various faunas. The Hawaiian Archipelago forms an unattached subregion of great antiquity. From the little that is known of them, the Carolines and Marshalls and perhaps the Mariannes, belong to the Austromalayan.

---

* I prefer this name of Huxley's to the usual "Australian" of authors. It is very confusing to term the whole Region 'Australian,' as one can then not understand readily whether the mainland, or the region as a whole, is intended.

I think therefore that Wallace's "Polynesian" Subregion should be rejected.

Celebes is usually included in the Papuan, but is perhaps, at present, best regarded as an unattached subregion.

The Fijian Isles seem to have a well marked affinity with New Guinea and the neighboring groups, or with the first of the following Australian.

The Australian Continent seems to possess four principal faunas:

1. The tropical forest, an impoverished extension of the Austromalayan, little known, and producing such forms as *Neomelicharia, Aneipo* and some fine Derbidae.
2. Eucalyptus-Forest, characterized by *Eurymela, Eurinopsyche* and *Platybrachys*. This is typical of the Euronotian.
3. Western Australia, which stands apart from the others.
4. Grass-lands and coast lands, probably typical in another way of the Euronotian, and characterized by common-place *Deltocephalus* and *Asiracidae*.

In the habitats, "K" stands for Prof. Koebele, "P" for Dr. Perkins, and "M" for Mr. Muir.

Mr. Muir's researches in Fiji were confined to Viti Levu. *Suva* is on Suva Bay in the Southeastern part; *Navua* on the river of the same name in the South-central; *Rewa,* on the Rewa river, a little east from Suva, and *Ba* (=Mba) on the Ba River in the northwest.

An expression of appreciation is due to Mr. W. E. Chambers, who has enriched this memoir with more than three hundred figures. No work on Hemiptera has previously appeared, in which such careful and detailed drawings of genitalia are given, affording characters which are the final arbiters of "species" in certain groups.

# BIOLOGIC NOTES.

## STRIDULATION.

In my first memoir (p. 285) it was stated that though *Perkinsiella saccharicida* had often been heard to stridulate distinctly, by the Entomologists of this Station, researches on the phenomenon had not yet been made

On his return from Fiji, Mr. Muir handed me the following notes, upon which it is scarcely necessary to enlarge:

"One hot, still morning, when collecting in Fiji, my attention was attracted to a small palm, from which a distinct noise of insects stridulating proceeded. I found the underside of the leaves covered with hundreds of a small red leafhopper (*Muiria stridula* Pl. 20 figs. 10-13). Their tegmina and wings were erected above the back and occasionally gave one or two rapid movements; sometimes the abdomen was jerked up and down. I recognized it as similar to one I had taken in Natal some years ago, in which the wings were exceedingly small and used entirely as stridulating organs. Upon examination I found the wings in the present species were likewise used for that purpose. The tegmina are about 6 mill. long, whilst the wings are only half a millimetre, the anal lobe being larger than the rest of the wing, thickened and corrugated on the hind margin of the upper side.

"The costal margin is turned over and catches into a fold along the margin of the tegmina; by this means it moves with the tegmina. The corrugated surface is opposed to the anterior angles of the abdomen where there are several white bristles situated.

"In another, (*Proutista moesta* Pl. 20 figs. 8-9) from Java, the tegmina are about 5½ mill. long and the wings 3 mill., the anal area larger in proportion to the rest of the wing and corrugated on the upper side.

"In another, (*Pyrrhoneura saccharicida* Pl. 20 figs. 6-7), from Fiji, the tegmina are about 4 mill. long and the wings 3 mill. the broad edge of the anal area being corrugated. The corrugations thin out gradually on each side, and one can see that they are only a prolongation and intensification of the minute corrugations that border the hind margin of the wing from the end of the costal margin to the base of the wing.

"In another, (*Lyricen imthurni,* Pl. 20 figs. 3-5), from Fiji, the proportional size of the tegmina to the wings is more normal, about 7½ to 5½, and the anal areas of the latter are normal, bearing a strongly corrugated patch near the basal edge.

"Upon examining the anal area of the wing of *Perkinsiella saccharicida,* an enlarging of the corrugation along the basal portion of the edge can be seen. I am in doubt if this could be the means by which they produce the sound."

(Pl. 20 figs. 1-2 represents the wings of *Pyrrhoneura citharista*). Mr. Muir, also, before leaving for the Orient, left me some mounts of tegmina and wings, from which Pl. 20 figs. 1-9 have been made.

I have examined a considerable amount of material and find the stridulatory area developed as follows:

In most of the Derbidae and in some Asiracidae, this structure is present, in both sexes. I cannot find it in any other Auchenorhynchi, nor in those Asiracids in which the wings are rudimentary.

Since my last memoir, Froggatt has published "Australian Insects" (1907), in which there are short biologic notes on several Homoptera.

## CLASSIFICATION.

I have nothing to add to my general remarks on the distinctness of the Fulgoroidea, and their high place in the system. I think however that the Cicadoidea and Tetigonioidea should be merged, for although the former are less allied to any of the families of the latter, than these are among themselves, yet the general structure is fundamentally similar.

The system of the Auchenorhynchi now adopted is as follows:

Superfam. 1 Cicadoidea
Fam. 1 Cicadidae
Fam. 2 Cercopidae
Subfam. 1 Cercopinae
  2 Machaerotinae
Fam. 3 Tetigoniidae (embracing 10 provisional tribes, viz.: Ledrini, Stenocotini, Eurymelini, Phrynomorphini, Eupterygini, Cephalelini, Iassini, Macroceratogoniini, Penthimiini and Tetigoniini).
Fam. 4 Membracidae
Superfam. 2 Fulgoroidea
Fam. 1 Poekillopteridae
Subfam. 1 Lophopinae
Subfam. 2 Tropiduchinae
  (Tribes Tropiduchini and Tambiniini)
Subfam. 3 Ricaniinae
  (Tribes Ricaniini and Bladinini)
Subfam. 4 Poekillopterinae
  (Tribes Poekillopterini and Phalaenomorphini)
Subfam. 5 Tenginae
Fam. 2 Issidae
Subfam. 1 Issinae
  (Tribes Caliscelini, Issini)
Subfam. 2 Amphiscepinae
Subfam. 3 Eurybrachyinae
Fam. 3 Tetigometridae
Fam. 4 Fulgoridae

Subfam. 1 Cixiinae
(Tribes Cixiini, Achilini, Dictyophorini)
Subfam. 2 Fulgorinae
(Tribes Fulgorini, Omalocephalini, Aphaenini)
Fam. 5 Asiracidae
Fam. 6 Derbidae
(Tribes Derbini, Nisiini).

This is however merely tentative, as our knowledge of most groups is still extremely superficial, and nothing satisfactory can be done, till the nymphal instars of many species are described and figured.

There is no need to furnish characters again, separating the Fulgoroidea from the Cicadoidea, and the various families, and other divisions, are separated tabularly further on in their sevral places.

In my horismology, I have substituted "brachial" for "cubital," for the name of the third main vein arising from the apex of the basal cell, as there can be no doubt what "brachial" is, while there is much difference of opinion as to what "cubital" is. Melichar for instance, terming "cubital" what I call "basal stem of the radiomedian."

## LIST OF SPECIES.

The following are the new or notable genera and species etc., described in the following pages: (*) signifies that the nymphs are noted or figured.)

Fam. Cicadidae.
*Cicadetta tympanistria,* sp. n.
Fam. Cercopidae
*Nesaphrestes,* g. n.
*N. dreptias,* sp. n. *
*N. ptysmatophilus,* sp. n.
*Nesaphrogeneia,* g. n.
*N. vitiensis,* sp. n.
Fam. Tetigoniidae
*Stenocotis dimorpha,* sp. n .
*S. reticulata,* sp. n.
*Smicrocotis sidnica,* sp. n.
*Eogypona* *
*Rhotidus* * *stali* (n. n.)
*Idiocerus kisseis,* sp. n.
*I. nymphias,* sp. n.
*I. oreias,* sp. n.
*I. orodemnias,* sp. n.
*I. xantho,* sp. n.
*I. hyleorais,* sp. n.
*I. cupido,* sp. n.
*I. napais,* sp. n.
*I. aulonias,* sp. n.
*I. nereias,* sp. n.

*Eurymelias*, g.n. (*hyacinthus*)
*Ipo pompais*, sp. n.
*Macropsis ocroe*, sp. n.
*M. thymele*, sp. n.
*M. thyia*, sp n.
*M. thoantias*, sp n.
*Alseis*, g. n.
*A. osborni*, sp. n.
*Epipsychidion epipyropis*
*Oncopsis balli*, sp. n.
*Aceratagallia*, g. n. (*sanguinolentus*)
*Agalliopsis*, g. n. (*novellus*)
*Eurinoscopus hamadryas*, sp. n.
*Hybrasil*, g. n.
*H. brani*, sp. n.
*Dryadomorpha lotophagorum*, sp. n.
*Tortor*, g. n.
*T. daulias*, sp. n. *
*Tartessus idyia*, sp. n.
*T. itonias*, sp. n.
*T. issa*, sp. n.
*T. io*, sp. n.
*T. iambe*, sp. n.
*T. ianthe*, sp. n.
*T. ianassa*, sp. n.
*T. ianeira*, sp. n.
*T. iokaste*, sp. n.
*Iberia*, g. n. (*bolivari*)
*Thymbris*, g. n.
*T. inachis*, sp. n.
*T. iphianassa*, sp. n.
*Putoniessa*, g. n.
*P. dignissima*, sp. n.
*Xestocephalus vitiensis*, sp. n.
*X. pallidiceps*, sp. n.
*X. p.* var. *contortuplicatus*, n.
*X. p.* var. *decemnotatus*, n.
*X. australensis*, sp. n.
*X. purpurascens*, sp. n.
*X. sidnicus*, sp. n.
*Eutettix melaleucae*, sp. n.
*Deltocephalus lotis*, sp. n.
*D. polemon*, sp. n.
*D. histrionicus*, sp. n.
*D. lucindae*, sp. n.
*Conosanus chlorippe*, sp. n.
*C. hospes* *
*Soracte*, g. n.
*S. apollonos*, sp. n.
*Nephotettix eurytus*, sp. n.
*Limotettix filicicola*, sp. n.
*L. tachyporias*, sp. n.
*L. capitatus*, sp. n.
*Thamnophryne*, g. n.
*T. nysias*, sp. n.
*Driotura aristarche*, sp. n.
*Allygus lotophagorum*, sp. n.
*Lonatura austrina*, sp. n.
*Nesosteles dryas*, sp. n.
*N. aurantiigera*, sp. n.
*N. phryne*, sp. n.
*N. chloe*, sp. n.
*Apheliona*, g. n. (*bioculata*)
*Cicadula hyadas*, sp. n.
*C. euryphaessa*, sp. n.
*C. vitiensis.*
*Erythroneura sidnica*, sp. n.
*E. doris*, sp. n.
*E. lalage*, sp. n.
*E. leucothoe*, sp. n.
*E. rewana*, sp. n. *
*Dialecticopteryx*, g. n.
*D. australica*, sp. n.
*Paradorydium brighami*, sp. n.
(subg. *Deltodorydium*, n.)
*P. ovidii*, sp. n.
*Tharra kalypso*, sp. n.
*T. ogygia*, sp. n.
*T. kassiphone*, sp. n.
*T. nausikaa*, sp. n.

*T.* sp? *
*Muirella,* g. n.
*M. oxyomma,* sp. n.
*Vulturnus vulturnus*
*V. voltumna,* sp. n.
*V. virgidemia,* sp. n.
*V. vanduzeei,* sp. n
*V. vultuosus,* sp. n.
*V. vaedulcis,* sp. n. *
*V. vappa,* sp. n.
*Leucopepla,* g. n.
(*bituberculata*)
*Syringophora,* g. n. (*brevis*)
*Cymbalopus,* g. n.
(*bigibbosa*)
Fam. Membracidae
*Zanophara leda,* sp. n.
*Z albovittata,* sp. n.
*Acanthuchus iasis,* sp. n.
*A. euryone,* sp. n.
*A. eurynomus,* sp. n.
Fam. Poekillopteridae
*Eodryas,* g. n. (*melichari*)
*Dolia,* g. n. (*walkeri*)
*Astorga saccharicida* *
*Siphanta granulicollis*
*S. acuta* *
*Thanatochlamys,* g. n.
*T. tristis,* sp. n.
Fam. Issidae
*Apsadaropteryx,* g. n.
(*elongatulus*)
*Phaeopteryx,* g. n.
*P. sidnicus* *
*Orinda,* g. n. (*lucindae*)
*Chlamydopteryx,* g. n.
*C. eurobium,* sp. n.
*Tylana dyakana,* sp. n.
Fam. Fulgoridae
*Oliarus lilinoe,* sp. n.
*O. tasmani*
*O. lubra* var. *vitiensis* n.
*O. saccharicola,* sp. n.
*U. melanesica,* sp. n.
*Urvillea,* g. n.
*Nesocharis,* g. n.
*N. kalypso,* sp. n.
*Myndus vitiensis,* sp. n .
*Leirioessa,* g. n.
*L. tortricomorpha,* sp. n.
*L. vitiensis,* sp. n.
*Leptochlamys,* g. n.
*L. compressa,* sp. n.
*Dystheatias,* g. n.
*D. beecheyi,* sp. n.
*D. b.* var *fuscata,* n.
*Australoma,* g. n.
*A. austrina,* sp. n.
*Quirosia,* g. n.
*Q. vitiensis,* sp. n.
*Phenelia* sub. *Nephelia,* n.
*P.* (N.) *bicuneata,* sp. n.
*P.* (N) *tristis,* sp. n.
*Callinesia,* g. n.
*C. pulchra,* sp. n.
*C. ornata,* sp. n.
*C. venusta,* sp. n.
*C. pusilla,* sp. n.
*Callichlamys,* g. n.
*C. muiri,* sp. n.
*C. undulata,* sp. n.
Fam. Asiracidae
*Ugyops vitiensis,* sp. n.
*Melanesia,* g. n.
*M. pacifica,* sp. n.
*M. p.* var *strigata,* n.
*Criomorphus australiae,* sp. n.
*Dicranotropis anderida,* sp. n.
*D. aristoxenus,* sp. n.
*D. muiri,* sp. n.
*Purohita arundinacea*
*Leimonodite,* g. n. (*beckeri*)
*Perkinsiella sinensis,* sp. n.
*P. pseudomaidis* *

*P. graminicida* *
*P. saccharicida* *
*P. vitiensis* *
*Hadeodelphax persephone,* sp. n
*H. pluto* var. *pallidior,* n.
*D. dryope,* sp. n.
*D. ochrias,* sp. n.
*D. matanitu,* sp. n.
*D. disonymos,* sp. n.
*D. hyas,* sp. n.
*D. geranor,* sp. n.
*D. kolophon,* sp. n.
*D. kaha,* sp. n.
*D. anemonias,* sp. n.
*D. pylaon,* sp. n.
*D .albotristriatus,* sp. n.
*Tropidocephala dryas,* sp. n.
*T. hamadryas,* sp. n.
*Anectopia,* g. n.
*A. mandane,* sp. n.
*A. igerna,* sp. n.
*Haplodelphax,* g. n.
*H. iuncicola,* sp. n.
*H. naias,* sp. n.
*H. euronotianus,* sp. n.
*Megamelus proserpina,* sp. n.
*M. persephone,* sp. n.
*M. sponsa,* sp. n.
*"Delphax"thyestes,* sp. n.
*D. ordovix,* sp. n.
*D. parysatis,* sp. n.
*D. ostorius,* sp. n.
*D. lazulis,* sp. n.
*D. leimonias,* sp. n.
*D. astyanax,* sp. n.
*D. algebra,* sp. n.
*P. dilpa,* sp. n.

*Proterosydne,* g. n.
*P. arborea,* sp. n.
*Stenocranus pacificus,* sp. n.
*S. agamopsyche,* *
*Saccharosydne,* g. n.
*S. saccharivora* *
Fam. Derbidae
*Suva koebelei*
*Basileocephalus thaumatonotus*
*Phaciocephalus nesogonias,* sp. n.
*P. nesodreptias,* sp. n.
*P. miltodias,* sp. n.
*P. pullatus,* sp. n.
*P. minyrias,* sp. n.
*Thyrocephalus leucopterus*
*Rhotana halosydne,* sp. n.
*Xiphadodite,* g. n.
*X. insulicola,* sp. n.
*Pyrrhoneura saccharicida*
*P. citharista,* sp. n.
*P.* (*Nesoneura* subg. n.)
*P.* (*N.*) *vitiensis,* sp. nov.
*Nesocore,* g. n.
*N. fidicina,* sp. n. *
*Lyricen,* g. n.
*L. imthurni,* sp. n.
*Proutista lumholtzi*
*Nesoniphas,* g. n.
*N. insignissima,* sp. n.
*Philadelpheia pandani*
*Muiria,* g. n.
*M. stridula,* sp. n.
*Phantasmatocera arborea*
*Nesophantasma,* g. n. (*vitiensis*)
*Swezeyia lyricen*
*Sikaiana nesiope,* sp. n.

### Superfamily *CICADOIDEA.*

This, after renewed investigation, appears to include the Tetigonioidea, thus embracing four families, which are distinguishable in the imago state as follows:

1. Three subcontiguous ocelli; sensory organs on the two basal segments of antennal flagellum very numerous; fore femora incrassate; no arolia; abdomen in the males with a sonorous apparatus on each side; venation very characteristic, tegmen typically with 5 "discoidals" and 8 apical veins, which occupy its greater part............................1 Cicadidae

1a Two ocelli, sometimes functionless; only a few sensory organs on the basal segements of antennal flagellum; fore femora rarely incrassate; arolia large............................(2)

2 Antennal flagellum composed of a large subpyriform basal segment and a slender seta; hind tibiae with one or two strong spines..................................2 Cercopidae

2a Antennal flagellum composed of numerous segments; hind tibiae unarmed; or if spined, almost always with more than 2 strong spines; usually seriately bristly...................(3)

3 Genae more or less dilated; pronotum never prolonged backwards ................................3 Tetigoniidae

3a Genae not or scarcely dilated; pronotum prolonged backwards in a process (except in a few forms of dubious position) ....................................4 Membracidae

The ova are usually, (perhaps always), in all these families, inserted in slits made in twigs or leaves.

The families may be distinguished in the nymphal stages (or at least the ultimate) temporarily as follows: (there are never any ocelli, nor are there special sensory organs on the antennae, head or abdomen, etc.):

1 Frons with very numerous, closely set bristles in the middle; antennae with about 9 segments, decreasing in size from the basal one. Fore femora enormously incrassate, with one or more large spines beneath; fore tibiae raptorial, with spines or large tubercles beneath; fore tarsi with 2 segments, the first annuliform, arising at about two-thirds of the length of the tibia and directed backwards, second segment long, slender, cylindric, with 2 uneven claws. Fore coxae not shorter than femora. No arolia. Middle and hind tarsi with 2 segments, first very short ........................................1 Cicadidae

1a Frons not bristly. Fore femora rarely incrassate, not spined beneath; fore tibiae not raptorial; fore tarsi bisegmentate, of varying proportions, the basal segment arising from the apex of the tibia; 2 subeven claws. Fore coxae shorter, generally very much shorter, than femora. Arolia present. Middle and hind tarsi never foliaceous (except the head and perhaps the legs....(3)

2 Dorsal surface more or less closely granulated, of very varying form, often foliaceous................3 Membracidae.

2a Dorsal surface not granulate. General form of the adult, never foliaceous (except the head and perhaps the legs....(3)

3 Legs not spined or bristly. Antennae with 7 to 9 well marked, subcylindric, segments .................4 Cercopidae

3a Legs nearly always bristly. Antennae usually n arly as in the adults ..............................2 Tetigoniidae

The Cicadidae are on the whole the most primitive of the Cicadoidea, despite the specialization of the sonorous orgains in the males. Their undeserved elevation to the front of the Homoptera is due to the latter circumstance and to their, usually, larger size. Their primitiveness is displayed in their general form, and especially in the structure of the antennae in all stages, approaching in this the Heteroptera. The three other families are rather more closely allied among themselves than to the Cicadidae; in the nymphs, the antennae of the Cercopidae approach the condition of the Cicadidae, but are perhaps a little more specialized in the adults than they are in the adult Tetigoniidae. In the latter, the legs are almost always more specialized than in the Cercopidae, which, on the whole, may be accorded the lower rank. The Membracidae are simply specialized Tetigoniidae, by way, probably of forms like *Agallia*.

Most authors persist in estimating the Membracidae as a very distinct group. Fowler (1894 Biol. Centr. Amer. Hom., II, p. 1) says, for example, "The Membracidae, as a whole, form one of the most distinct and unmistakable groups of all insects." How little this is the case is shown by the fact that today the systematic position of *Ulopa*, *Aethalion* and others is disputed, while Fowler himself referred the Eurymeline *Gargaropsis* (a synonym actually of *Bythoscopus*) to the Membracidae. A little, fantastic, development of the pronotum and minor changes in the head and legs are almost all that are necessary to change an *Oncopsis* into a Membracid. The earlier nymphs of such Membracids as *Entylia* are essentially Tetigoniine in form and structure.

It may be useful to repeat that these 4 families, Cicadidae, Cercopidae, Tetigoniidae and Membracidae are closely elated, and that it is very absurd to separate the first from the other three, as do most authors, by the Fulgoroidea; while still more absurd is the usual order of Cicadidae, Membracidae, Fulgoroidea, Cercopidae, Tetigoniidae.

## Cicadidae.

The Cicadidae have been divided by Distant into three subfamilies, characterized by the tympanal coverings, but the divisions do not seem natural, the Cicadidae being in fact remarkably homogeneous.

### (a). Australian Species.

As previously remarked, the Australian Cicadidae were discussed by Goding & Froggatt (1904 P. Linn. Soc. N. S. Wales XXIX, 561-670, Pls. XVIII-XIX); since then a number of supposedly new genera and species have been described by Distant and enumerated in his "Synonymic Catalogue of Homoptera. Part I Cicadidae" (1906, pp. 1-207). The Australian forms added since Goding & Froggatt's Monograph are as follows:

1 *Macrotristria nigronervosa* Distant 1904 A. M. N. H. (7) XIV 329 .............................. Queensland
2 *Cicada graminea* op. c. 428 ................. Queensland
3 *Dundubia vaginata* (Fabr.) [=*mannifera* Stal] (*Tettigonia vaginata* Fabr., 1787 Mant. Ins. II 266), said to be from Australia as well as India and the Malayan Region, but doubtfully correctly.
4 *Abricta elseyi* Distant 1905 A. M. N. H. (7) XVI, 281 .................................North Australia.
5 *A. castanea* op. c., 27..................North Australia.
6 *A. burgessi* op. c., 28......................Queensland.
7 *Burbunga inornata* op. c., 29..............W. Australia.
8 *Gudanga boulayi* op. c., 208.........................do.
9 *Cicadetta waterhousei* (*Melampsalta*) op. c., 271...... .................................. S. Australia.
10. *C. lactea* (*M*) l. c...........................Victoria.
11 *C. issoides* (*M*) op. c., 272........................... ................... New South Wales, W. Australia.
12 *C. montrouzieri* (*Birrima*) op. c., XVII 388 .......... ........................... New South Wales.
13 *Pauropsalta stigmatica* 1905, op. c., XVI, 273..S. Australia.
14 *P. dameli* l. c.

15 *Urabunana segmentaria* op. c., 274..........Queensland.
16 *Cyclochila virens* 1906 Entom., XXXIX 148..Queensland.
N. B. *C. australasiae* var. *spreta* God. & Frogg. was omitted in Mr. Distant's Catalogue.

## (b). Fijian Species.*

Only four species have been noted by Distant, and I can add only 3, (2 from my own collection), one of which, however, is new.

1 *Cyclochila australasiae* (*Tettigonia*) Donovan 1805 Ins. New Holland, Hem. Pl. 2, f. 1; a large male, expanding 120 mm. (in my collection). (**)
2 *Macrotristria angularis* (*Cicada*) Germar 1834 Rev. Ent. II, 68; a large male, expanding 131 mm., with dark ferruginous frons (in my collection). (**)
3 *Cicada kuruduadua* Distant 1881 Tr. E. S. London 645; Waterhouse 1882 Aid ident. Ins. I, Pl. C.
4 *Sawda* (?) *vitiensis* Distant 1906 Entom XXXIX, 12. (*Sawda* is probably not distinct from *Cosmopsaltria*).
5 *Diceropyga distans* (*Dundubia*) Walker 1858 List. Hom. Suppl. 10 (=*subfascia* (*Dundubia*) op. c., 11), recorded from Ovalau by Walker; 2 males and 1 female, the largest expanding 92 mill., taken at Rewa (March) by Mr. Muir.
6 *D. stuarti* (*Cosmopsaltria*) Distant 1882 Pr. Zool S. London 125 Pl. VII, f. 2;

Mr. Muir has taken 2 males at Rewa (March), which differ from Distant's descriptions as follows; they are 37 mill. long to the apex of the tegmen and expand 72 mill, being thus much larger; the frons is not so much produced basally as in Distant's figure, and (as somewhat shown in Distant's figure) the opercula do not nearly reach two-thirds of the length of the abdomen. Further, judging again by the figure, the opercula are less divergent during their first half, interiorly, and then more obliquely rounded.

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* I employed the terms "Viti" and "Vitian" in my first memoir, but Dr. Brigham assures me that "Fiji" and "Fijian" are the correct terms to use.

** Mr. Froggatt, who has examined these specimens, doubts very much that they came from Fiji.

## *Cicadetta* Kolenati.

This is a large genus of about one hundred described species, about three-fifths belonging to the Australasian Region. The following species is the first recorded from the Fiji Isles, and is the seventh Fijian Cicadid.

### 1. *tympanistria* sp. nov.

Pl. I, figs. 1-3.

Male. Ochreous: ocelli narrowly and incompletely margined with black. Eyes dark purplish brown. Pronotum with a median stripe and the hind margin yellow; six wedge-shaped black spots, the lateral ones rather irregular. Mesonotum a little embrowned, with 3 irregular black suffusions, the middle one somewhat dumb-bell shaped, with an incomplete yellowish-brown line down its middle; tufted posteriorly with golden yellow hair. Cruciform elevation yellow, the ends of the arms more or less fuscous. Metanotum yellow. Tegmina and wings milky hyaline, venation dark fuscous except the costal, subcostal, and sutural veins of the former which are yellowish green. The base and sides of the first tergite black, rest of this, the 2nd and 3rd (the latter narrowly dark apically) and basal half of 4th, yellow, the rest more or less fuscous. The whole of the underside luteous except as follows: antennal whip more or less fuscous; labium, tibiae and tarsi greyish-yellow; spines on fore femora black-tipped; sides of first sternite widely fuscous; apical three-fourths of abdomen purplish fuscous. Vertex rather flat, scarcely prominent before the eyes, about as wide between the eyes as the width of an eye. Frons rather narrow, scarcely as wide at base as the tempora together. Labium reaching just beyond middle coxae. Pronotum widening sublaminately posteriorly, not toothed laterally. Fore femora with three spines, the 1st the longest. Opercula oblique, narrow, at least twice as long as wide, subconstricted medianly externally, not reaching to the apical margin of the first sternite. Metasternum produced medianly in a small subvertical plate. Medioradial stalk elongate, completely fused, about as long as its first inferior branch; first apical cell a little longer than the second. Pygophor elongate, transversely striate.

Length to apex of abdomen 11 mill., expense of tegmina 30 mill.

Hab. Fiji, Rewa. (M).

The colouring, venation and opercula separate this from any *Cicadetta* known to me. It has an additional peculiarity in that the membranal appendix to tegmina and wings is of the slightest possible description, being visible only where the cells in meeting apically are very slightly notched.

## Cercopidae.

The nymphs have, in all the forms I have seen, spineless and bristleless legs.

Since my first memoir, I have acquired a copy of Westwood's "Notice of a tube-making Homopterous insect from Ceylon" (Tr. E. S. London 1886 pp. 329-33, Pl. VIII), from which the systematic position of the remarkable *Machacrota* is recognizable. It is evidently closely allied to *Polychaetophyes* and *Pectinariophyes*. I cannot recollect the exact appearance of *Hindola*, of which I have now no specimens for reference. This is the same as the preoccupied *Carystus* of Stal, and I do not think that the Swedish author would have placed *Carystus* and *Machacrota* in different subfamilies if the former had been the same as *Polychaetophyes*. I cannot recognize Stal's subfamilies, the characters he uses to differentiate the 'Cercopinae' from the 'Aphrophorinae' being to me of little value for that purpose. Two subfamilies are here accepted, and are separable as follows:

1 Subcostal vein of wing forked about the middle (or basal of that), so that there is a "supernumerary" cell. [Pl. 1, fig. 4]. Nymphs, so far as known, living in their own frothy secretion. ............................ *Cercopinae*.

2 Subcostal vein not forked, so that there is no supernumerary cell; veins united near the apical margin. [Pl. I, fig. 5]. Nymphs forming calcareous cases.......... *Machaerotinae*.

## Cercopinae.

The Australian and Fijian genera are disposable as follows, more for convenience than as an expression of their relationships:

1 Anterior margin of pronotum rounded................(2)

1a Anterior margin of pronotum straight................(6)
2 Head strongly narrowed near the base, elongate, subascendant. ...................................5 *Philagra*
2a Head not longer than wide across the eyes, not suddenly narrowed. ..........................................(3)
3 Tegmina very convex, little longer than broad. .4 ***Bathyllus.***
3a Tegmina little convex, at least twice as long as broad. .(4)
4 Vertex and pronotum carinate................1 *Cercopis.* [=*Aphrophora*].
4a Vertex and pronotum not carinate...................(5)
5 Tegmina with level surface, pubescent, not punctured..... ................................... 2 *Eurycercopis.*
5a Tegmina irregularly raised and depressed, not pubescent, but very closely punctured................3 *Nesaphrestes.*
6 Ocelli nearer to one another than to the eyes.........(7)
6a Ocelli not nearer to one another than to the eyes......... ..................................... 11 *Cosmoscarta.*
7 Frons sulcate. ..................................(8)
7a Frons not sulcate...................................(11)
8 Posterior margin of pronotum medianly truncate......... ........................................ 7 *Aufidellus.*
8a Posterior margin of pronotum emarginate............(9)
9 Pronotum somewhat hairy, with 8 callous spots along the anterior margin. ............................8 *Petyllis.*
9a Pronotum with not more than two callous spots......(10)
10 Tegmina subopaque, pale, yellowish-brown, veins broad and clearly marked. ............................9 *Aufiterna.*
10a Tegmina opaque, coriaceous, black and red, veins narrower, more obscure. .........................10 *Euryaulax.*
11 Scutellum longer than wide.......................... ....................12 *Tomaspis* (two Walkerian species).
11a Scutellum equilateral .................13 *Nesaphrogeneia*

*Nesaphrestes* gen. nov.

Allied to *Clovia*, but the clypeus is longitudinally carinate, generally strongly, and the tegmina are much narrower. I have no examples of *Clovia* now to examine, but comparing with the rather poor figure of *C. birarensis*, Kirkaldy (in Tr. E. S. London 1905, Pl. XVII, f. 3,) the pronotum in *Nesaphrestes* is acute-angularly emarginate posteriorly, also the brachial vein of the wing forks between the cross-vein and the apex. (not *at* the cross-vein), and there are 4 apical cells in the tegmen. Also allied to *Eurycercopis*, but the tegmina are unevenly impressed (principally longitudinally and along the subcosta), and are finely and closely punctured. Type *muiri*. There are two species, distinguished by the size, colour, &c.

### 1. *dreptias* sp. nov.

Vertex, pronotum and scutellum pale yellowish-brown, suffused and transversely barred, brokenly and irregularly, with darkish fuscous, or irregularly suffused; posterior angle of scutellum pale yellowish-brown. Frons ventrally pale yellowish-brown, with curved concentric dark fuscous lines radiating from a median pale yellow line and practically attaining the lateral margins. Apical third of frons, the clypeus, lora coxae, sterna in part laterally, apical segment of labium pleurites, &c., blackish. Tegmina coriaceous, fuscous, darker on the corium, a spot on the extero-lateral margins near the apex, and the apical and subapical veins, whitish. Fore and middle femora blackish-brown, pale at the apex, hind femora blackish brown; tibiae dark fuscous, annulate or marked with brownish-testaceous.

*Female*. Pygophor pale beneath, ovipositor dark.

Length 8-9½ mill.

Hab. Viti Levu, Rewa (March, Muir's No. 165), on a native tree "in the bush."

Nymphs pale testaceous, hind tibiae polished, spineless. Probably live in their own secretion.

### 2. *ptysmatophilus* sp. nov.

Brownish-ochraceous; face, pro- and mesosterna laterally, and tergites mostly, blackish; antennae ochraceous; sometimes a faint pattern of radiating lines on frons towards the lateral margins. Tegminal veins pale yellowish or yellowish-fuscous. Exterior half of basal third of corium suddenly and angularly narrowing on the middle third of exterior margin, blackish, a fuscous spot in the fourth apical cell. Legs yellowish-testaceous, fore and middle femora dorsally blackish-brown in the middle, fore and middle tibiae blackish-brown apically and basally.

*Male*. Sternites blackish, genital segments ochraceous.

*Female*. Pygophor ochraceous, ovipositor blackish.

Length (male) 5½-(female) 7¼ mill.

Hab. Viti Levu, Rewa (Mar.-Apr., M.).

## *Nesaphrogeneia* gen. nov.

Allied to *Locris*, but is very feebly, if at all, carinate on the frons, and the pronotum is angularly emarginate at the base medianly. The head dorsally is much more obtusely and roundly angulate anteriorly. Pronotum and tegmina rugosely-punctured, apical three-fourths of the former and the head strongly declivous. Wing venation similar to that of *L. vestigans* and *amauroptera* as figured by Breddin.

### 1. *vitiensis* sp. nov.

Head, pronotum anteriorly, scutellum and body beneath, pale yellowish-brown; base of frons ventrally, antennae, last segment of labium dorsally, &c., dark fuscous or blackish-brown. Ocelli rubid. Rest of pronotum pale yellow. Tegmina pale yellowish-brown suffused with rosy, especially laterally and apically, with short, yellowish pubescence (especially on clavus); veins rosy, at least the lateral and apical ones; wing-veins dark fuscous. Legs pale yellowish-testaceous, tibiae more or less fuscous in part. Sternites more or less fuscate.

Length 5⅓ mill.

Hab. Viti Levu, Rewa (Feb., Mar., M.)

## Machaerotinae.

At the moment of going to press, I have received the first part of the 68th Vol. of the Stettiner Ent. Zeit., containing a review of this subfamily (*). The Australian genera may be disposed as follows:

1 Scutellum not sulcate; without an appendage..........(2)

1a Scutellum sulcate with an appendage...3 *Pachymachaerota*.

2 Vertex almost perpendicular, very short. Nymph cases elongate, subconical, more or less porrect, gradually widening from the base......................1 *Polychaetophyes*.

2a Posterior margin of head raised. Ocelli farther apart. Frons more swollen. Pronotum less declivous, and longer in proportion to head. Nymph cases smoother and slenderer..............................2 *Pectinariophyes*.

The first two have been omitted by Schmidt. In *Pachymachaerota* he places *Machaerota pugionata* and *signoreti* (=|| *pugionata* Sign.).

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* E. Schmidt "Monographie der Subfamilie Machaerotinae Stal........." pp. 165-200, figs. 1-8 (May, 1907.)

## Tetigoniidae.

Further investigation has convinced me that the subfamilies proposed in my former memoir cannot stand. Search has failed to reveal any sharply limited characters to form subfamilies. There is complete gradation from *Tetigonia* to *Eurymela* in the position of the ocelli and in the form of the leg spines. *Eurymela* is remarkably Cercopoid, especially apparently as regards the spines of the hind tibiae, but there is a fundamental difference. The spines in the Cercopidae are apparently solid, direct projections from the leg, and have no value for springing purposes, while in *Eurymela* and other allied forms, in which there are strongly developed, solid-looking spines, each of these always emits a hollow bristle, which is of value for springing in proportion to its length and to the number on the leg. The bristles in the more typical Tetigoniidae are also hollow and not direct productions of the leg, but socketed. The difference between the spines of *Tetigonia* and *Eurymela* is that in the former, the socket is small, the bristle long; in *Eurymela* the socket is large and the bristle short. [Pl. XI, figs. 18-20.]

For convenience, the following tribes based on habitus, are temporarily retained. I do not feel certain that, compared with the divisions of the Fulgoroid families, the Cicadoidea ought not to be divided into 2 families, Cicadidae and Tetigoniidae, the latter forming three subfamilies, Tetigoniinae, Cercopinae and Membracinae, but such a question is of minor importance, so long as the relative values of the divisions are understood.

1 Legs always more or less spiny or strongly bristly....(2)

1a Legs unarmed or feebly bristly....................(10)

2 Ocelli on the dorsal part of the head, distinctly away from its anterior margin....................................(3)

2a Ocelli (if present) on the margin between vertex and frons; or dorsally, practically contiguous with the margin; or on the ventral side of the head.........................(6)

3 Spines on the hind tibiae usually feeble except on one edge where they are strong, with rather short bristles. Stout forms, the head usually more or less laminate........1 Ledrini

3a Bristles on the hind tibiae strong and long, not spinose. (4)

4 Exterior discoidal area of tegmen undivided up to the apical cells; ocelli on the vertex anterior to the apical margin of the eyes ................................. 8 Macroceratogoniini

4a Exterior discoidal area divided, so as to form an apical cell ........................................... (5)

5 Elongate forms; ocelli basal of the anterior margin of the eyes, on the vertex.......................... 10 Tetigoniini

5a Stouter forms; ocelli apical of the anterior margin of the eyes, on the vertex (Gyponidae auctt) ........... 9 Penthimiini

6 Vertex raised perpendicularly at the sides and base. Exterior discoidal area of tegmen undivided to the apical cells ............................................. 7 Iassini

6a Vertex not raised at the sides and base. Exterior discoidal area divided (in the long winged forms at least)......(7)

7 Head exceedingly declivous; ocelli on the vertex ventral of the bend of the head; spines and bristles on hind tibiae somewhat diverse in different forms........................... ......................... (Bythoscopidae auctt) 3 Eurymelini

7a Vertex usually more or less porrect; ocelli (if present) on the angular margin of the head.....................(8)

8 Radial, median and brachial veins very obscure basally, (apparently springing independently from the basal cell or uniting close to it, except *Ancono* and *Dialecticopteryx*); ocelli absent or feeble............................... 5 Eupterygini

8a Venation normal (except in short winged forms, or if obscure, then so all over); ocelli on the angular margin of the head, or touching it dorsally, rarely obsolescent...........(9)

9 Vertex strongly emarginate basally, ocelli in pits on the angular margin; legs spiny..................... 2 Stenocotini

9a Vertex rarely much emarginate basally, ocelli never in pits, (or if so, then the legs bristly, not spiny)..4 Phrynomorphini

10 Head laminate or at least elongately produced. Venation degraded ............................6 Cephalelini (restr.)

10a Head never elongately produced, never laminate...... .................... (incl. Kahavaluinae) 11 Megophthalmini

## Tribe Ledrini.

This tribe is nearly always characterized as having a foliaceous pronotum, owing to the fact that *Ledra* is the only European genus and that the tribe is not represented in North America. It is characterized by the more specialized legs and by the dorsal position of the ocelli, but is not altogether natural. Some forms, e. g., *Rhotidus*, have a very close resemblance to Phrynomorphine genera such as *Annidion*, but are distinguished by the position of the ocelli.

## Provisional Table of Genera.

1a Head broadly laminate.........................(3)
2 Claval suture obsolete.......................1 *Sichaea*
2a Claval suture distinct .......................2 *Titia*
3 Pronotum with the lateral margins acute-angulately projecting ......................................... (4)
3a Pronotum not as above..........................(5)
4 Pronotum anteriorly in the middle and head, perpendicularly declivous ................................3 *Proranus*
4a Pronotum and head a little declivous..........4 *Tituria*
5 Eyes exteriorly margined by part of the vertex.......................................................5 *Betsileonas*
5a Eyes not margined exteriorly.....................(6)
6 Hind tibiae dilated ..........................(7)
6a Hind tibiae cylindric...........................(10)
7 Pronotum with a compressed auriform process sublaterally ...........................................6 *Ledra*
7a Pronotum normal ..............................(8)
8 Vertex anteriorly truncate, basally with 2 flat, remote tubercles .................................... 7 *Oclasma*
8a Vertex not truncate, without the tubercles ...........(9)
9 Pronotum declivous .....................8 *Platyhynna*
9a Pronotum not declivous ................9 *Ledromorpha*
10 Tegmina short ......................... 10 *Dusuna*
10a Tegmina normal .............................(11)
11 Tegmina reticulate apically .....................(12)
11a Tegmina not reticulate ..................13 *Ledropsis*
14 *Confucius*, 15 *Rhotidus*, 16 *Rubria*.
12 Pronotum laminately ridged ..............11 *Jukaruka*
12a Pronotum not ridged .................12 *Camptelasmus*

Distant has overlooked the fact that *Petalocephala* is a synonym of *Camptelasmus*.

In the "Homoptera-Fauna von Ceylon," Melichar refers *Gypona striata* Kirby to *Siva* (=*Krisna*), and *G. prasina* Walker to *Acropona*, both Phrynomorphine genera. I cannot now refer to the types, which are presumably in the British Museum, but it was on a cotype of the former and a compared example of the latter, that I founded my genus *Eogypona* (1901 Entom. XXXIV, 38, inexplicably treated by Melichar as unpublished!) apparently a synonym of *Camptelasmus* (=*Petalocephala*), previously having renamed *G. striata*, "kirbyi," and *G. prasina*, "walkeri," on.

account of their preoccupation.

Moreover, I do not think Melichar has correctly referred *Ledropsis*. I have not seen the types, but I believe that ***Rhotidus*** and *Rubria* are synonymous with this, or very closely allied. The nymphs of *Eogypona* (=? *Camptelasmus*) and *Rhotidus* (=? *Ledropsis*) are very different. The former are very flat, laminately foliaceous, and exceedingly thin, while the latter are not unlike the adults.

### *Rhotidus* (=? *Ledropsis*).

The female ultimate sternite is very similar in all the species described by me. The posterior margin is slightly sinuate, with a small median notch which is almost obsolete in *ledropsiformis*. In *viridescens*, and *informis* it is obtuse-angled or somewhat rounded; in *horrendus* it is similar but more acute; in *monstrum*, *ingens* and *flavomaculatus* it is distinctly rounded.

Distant has described (1907 A. S. E. Belg. LI):

13. *aequalis* op. cit. 193. Queensland, and has transferred here *Ledra teliformis*, *navicula* and *cuspidata* Walker. This preoccupies the "*Rhothidus navicula*" of Stal, from Queensland, which is obviously not that of Walker; for the Stalian species, I propose the name of *stali*.

### *Ledropsis*

Distant has described:

1. *froggatti* op. cit., 192 .................... New South Wales

Distant has also described:

*Jukaruka* (g. n.) *typica* op. cit. 190 ................ Queensland

In the list of unknown Australian forms, I omitted *Rubria sidnica* (*Xerophloea*) Stal 1859 Eugenie's Resa. Ins. 288( Sydney.)

### Tribe Stenocotini.

This tribe differs from the Ledrini only in the position of the ocelli, which are situated in elongate pits on the margin connecting the vertex and the frons, and by the great emargination of the vertex basally. I know only three genera, all Australian, which have been analyzed on p. 368 of my former memoir.

## *Stenocotis* (*).

### 1. *dimorpha* sp. nov.

*Stenocotis planiuscula* Kirkaldy 1906 Bull. H. S. P. A. Ent. I, Pl. XXV, figs. 4 and 8 (=male, not of Stal.).

*Male.* Whitish, tessellated with pale ferruginous and blackish-brown; frons pale with a longitudinal blackish median stripe widening out sometimes apically, sometimes basally. Underside and legs mostly black (hind tibiae sometimes brownish). Genital segments partly dark, partly pale. Tegmina hyaline, with the veins blackish and white alternately; the basal fourth blackish, closely spotted with testaceous and with some larger white markings; there is also a transverse dark band just apical of the middle. The apical veins are not reticulate.

*Female.* Pinkish-brown and yellowish-brown tessellated, or brownish and dark fuscous tessellated. Underside yellowish testaceous, nearly unicolorous. Tegmina nearly unicolorous (within range of ferruginous and yellowish) with semireticulate apical part. Ultimate sternite produced medianly, the produced part rounded posteriorly. Ovipositor much longer than the long pygophor which indeed extends distinctly beyond apex of tegmina.

Length 15 (male); 22-3 mill. (female).

Hab. Queensland, Bundaberg (Nov.) As it is just possible that these sexes do not belong to the same species, the male is selected as type.

N. B. In my former bulletin. p. 476, in the explanation of Pl. XXV, f. 4, for "female" read "male."

### 2. *reticulata* sp. nov.

*Stenocotis planiuscula* Kirkaldy, l. c., figs. 3, 6 and 7 (=female).

*Females*: like those of *S. dimorpha*, but with a slender longitudinal median blackish line on vertex; tegmina more reticulate apically. Pygophor almost as long as ovipositor, which is not longer than the tegmina.

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* Since this was in proof, I have received the 6th part of the A. S. E. Belg. LI (July 3, 1907) containing Distant's "Contributions to a Knowledge of the Ledrinae" (pp. 185-97.) He disputes my citation of *S. vittata* (=*depressa* Walker) and proffers instead *S. planiuscula*. I cannot accept this. In 1854 Stal founded *Stenocotis* for 2 species, *planiuscula* and *subvittata*. No type was mentioned and no comparison was made between the species. In 1856 Stal redescribed the genus and redescribed *subvittata*, figuring it. I hold that this fixes the type as *subvittata;* if not, *subvittata* is then the type, because I was the next author to deal with the genus and fixed it. The argument put forward by Distant, that *planiuscula* is the type because the first species mentioned by Stal, is worthless and inconsistent with Distant's own method in other cases. I was aware that Stal had cited *subvittata* as a synomym of *depressa* and quoted it as such on the next page, overlooked by Distant.

Length 20 mill.

Hab. Queensland, Brisbane (June).

Distant has recently described.

*S. nigrescens* op. cit. 194, Queensland.

### *Smicrocotis.*

#### 1. *obscura*

Female ultimate sternite nearly truncate; pygophor almost as long as the ovipositor which scarcely extends beyond apex of tegmina.

#### 2. *sidnica* sp. nov.

Similar to the type, but the vertex is very short, ascendant, rounded apically. Frons not longitudinally carinate in the middle. Pronotum not carinate. Testaceous (with a green tinge) tessellated with yellowish, pinkish-brown and blackish-brown. Face and sterna pale ferruginous-brown tessellated with blackish-brown and spotted with testaceous. Scutellum testaceous, tessellated with pinkish-brown. Tegmina hyaline tinged with cinereous, more or less feebly tessellated with dark and pale brown, veins pale ferruginous-brown, infuscate in parts, not reticulate. Legs subsanguineous, spotted with testaceous, femora more or less marked with blackish brown. Abdomen below blackish brown (except the apical margins very narrowly).

Length (male) 7½ mill.

Hab. New South Wales, Sydney, (Jan., K.).

This may be the male of one of the following species, but the non-carinate pronotum probably separates it.

Distant has described:

3. *pallescens* op. cit. 195, New South Wales.
4. *infuscata* l. c., Queensland.
5. *projecta* op. cit. 196, New South Wales.

### *Kyphocotis.*

#### 1. *tessellata.*

*Female*: ultimate segment like that of *Stenocotis dimorpha*, ovipositor extending somewhat beyond pygophor and a little beyond apex of tegmina.

Distant has described:

2. *fasciata* op. cit. 196, Queensland.
3. *parva* op. cit. 197, Queensland.

### Tribe Eurymelini.

Although there is no sharply-drawn character separating this from the Phrynomorphini, it is convenient to reserve it for those forms in which the ocelli are actually ventral, that is apical, of the angulation of the head. It is in some of these forms that the frons is strongly demarcated from the vertex, though of course the "suture" is a false one and really only a deep impression in the chitin. At first I thought that this would prove a divisional character, but unfortunately it is only specific.

### Provisional Table of Genera.

*Trocnada* and *Eurymeloides* are too vaguely diagnosed to admit of insertion. *Igerna* is probably near *Pediopsis*, but I do not now know the nature of the striation on the pronotum.

*Strongylomma* and *Melicharella* are known only by their descriptions.

1 Ocelli absent ........................1 *Strongylomma*
1a Ocelli present ..................................(2)
2 Tegmen with an appendix ......................(3)
2a Tegminal appendix absent, or if present, very minute and the head dorsally wider in the middle than at the sides (i. e. *Batracomorphus*) ..................................(6)
3 Tegmina hyaline; appendix entire ..................(4)
3a Tegmina coriaceous, or at least the veins very strong: appendix not reaching beyond about half the length of the apical cells ..........................................(5)
4 At least one subapical cell in the tegmen......2 *Idiocerus*
4a No subapical cells ......................3 *Pedioscopus*
5 Tegmina coriaceous, mostly dark with a white or coloured pattern, venation feeble ..........................5 *Eurymelias*
(=*Eurymeloides* Kirkaldy 1906, apparently not of Ashmead (*), type *hyacinthus* (Kirkaldy)
5a Tegmina subhyaline, dingily coloured, veins strong..4 *Ipo*

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* Ashmead says "a double row of very weak spines," and cites no type.

6 A keel between the dorsal and ventral parts of the head ........................................6 *Melicharella*

6a No such keel ....................................(7)

7 Pronotum strongly striate obliquely ................(8)

7a Pronotum transversely striate, if at all (**)........(9)

8 Anterior margin of dorsal part of head almost rectangular; face flattish. (type *virescens*).................7 *Macropsis*

8a Anterior margin rounded; face convex (type *tiliae*)........................................................8 *Pediopsis*

9 Ocelli immediately at the base of the ventral part of the head ..................................9 *Epipsychidion*

9a Ocelli well on the ventral part...................(10)

10 Tegmina reticulate apically. Frons angulate in profile, as also clypeus. Hind tibiae with 2 or 3 strong spines. Last ordinary sternite (female) bipartite......................(11)

10a Tegmina not reticulate apically. Frons not angulate in profile, nor clypeus. Hind tibiae multispinulose. Last ordinary sternite (female) not divided..........................(12)

11 Last ordinary sternite (female) reaching the lateral margins of the abdomen.........................10 *Eurymelops*

11a Last sternite not nearly reaching the lateral margins...............................................11 *Eurymela*

12 Lora not nearly touching the apical margin of the clypeus ............................................ (13)

12a Lora practically touching the apical margin........(14)

13 Frons separated basally; legs more or less specialized................................................ 12 *Alseis*

13a Frons not separated basally; legs normal........................13 *Oncopsis*. (=*Bythoscopus* auctt; type *flavicollis*).

14 Frons separated basally. Antennae inserted in a feeble cavity, their bases free..............................(15)

14a Frons not separated basally. Antennae inserted in a deep cavity, beneath a ledge..............................(17)

15 Pronotum transversely striate; nymphs not horned nor dorsally serrate. (type *sanguinolentus* Provancher)...........................................14 (***) *Aceratagallia*

15a Pronotum not striate; nymphs horned and serrate...(16)

16 Posterior margin of vertex regularly curved, the vertex being obsolescent behind the eyes. Nymph with two anterior

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** Sometimes, in *Oncopsis*, the striation becomes a little oblique anteriorly.

*** These characters were pointed out and used for divisional purposes by Osborn and Ball in their treatment of *Agallia*. They are good genera, in my opinion.

projections on the head. (type *consobrina* Curtis=*puncticeps* Germ.).................................. 15 (***) *Agallia*

16a Posterior margin of vertex emarginate, but margining the eyes behind. Nymph with the entire posterior margin of the vertex elevated, truncate as seen dorsally. (type *novellus* Say) .................................... 16 (***) *Agalliopsis*

17 Clypeus fused with frons..........................(18)

17a Clypeus not fused with frons....................(19)

18 Face longer than wide......................17 *Nehela*

18a Face wider (between the eyes) than long............. .................................... 18 *Thalattoscopus*

19 Pronotum reaching beyond the anterior margin of the eyes, first two wing veins apparently not confluent........(23)

19a Pronotum not reaching as far as the middle of the eyes, first two wing veins confluent towards the apex..........(20)

20 Head dorsally wider in the middle than at the sides; a minute appendix close to apex of clavus....19 *Batracomorphus*

20a Head dorsally at least as wide at the sides as in the middle ................................................ (21)

21 Two subapical cells in the tegmen................(22)

21a Three subapical cells................. 21 *Eurinoscopus*

22 Lateral keel of pronotum not reaching the eye, but curving far down onto the pleura. Head scarcely narrower than pronotum. Clypeus strongly convex, very broad at base, suddenly strongly narrowed beyond the middle to the rounded apex.... ........................................20 *Straganiopsis*

22a Characters not as above (=*Macropsis* auctt., type *lanio.*) ..................................... 22 *Bythoscopus*

23 Head dorsally angulate anteriorly, and angulately emarginate posteriorly. Pronotum sinuate posteriorly. Face about as long as wide between the eyes.................23 *Stonasla*

23a Head anteriorly lightly rounded. Pronotum truncate between the scutellar angles. Face much wider than long.... ........................................24 *Macroceps*

## *Idiocerus.*

The venation in this large genus is very variable. The eleven Australian species are separable as follows:

1 Head spotted ....................................(2)

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*** These characters were pointed out and used for divisional purposes by Osborn and Ball in their treatment of *Agallia*. They are good genera, in my opinion.

1a Head immaculate ............................(4)
2 Vertex with 2 spots ............................(3)
2a Vertex with 4 spots............................ 1 ***kisseis***
3 Tegmina hyaline tinged with greyish or greenish; veins of corium sanguineous ............................2 ***nymphias***
3a Tegmina brownish fuscous, with two or three large translucent spots medianly............................3 ***oreias***
4 Tegmina with a dark spot at junction of clavus and membrane and another at the apex of the basal part of the subcostal cell ............................4 ***orodemnias***
4a Tegmina with a longitudinal fuscous stripe........(5)
4b Tegmina immaculate ............................(6)
5 General colouring yellowish or orange.......5 ***xantho***
5a General colouring creamy grey, sometimes rosy............................6 ***hyleorais***
6 Tegminal veins clear; some at least sanguineous....(7)
6a Tegminal veins more obscurely indicated; testaceous or pale greenish ............................(8)
7 More or less suffused with deep rosy, veins concolorous ............................ 7 ***cupido***
7a Veins mostly clear green, some of the apical ones sanguineous ............................ 8 ***ipo***
8 Length over 6 mill............................ 9 ***napais***
8a Length over 5 mill............................10 ***aulonias***
8b Length 4 mill ............................11 ***nereias***

### 1. *kisseis* sp. nov.

Head pale testaceous, vertex with 4 black spots, the larger pair visible dorsally and nearer the eye than their own diameter; apical of these a smaller pair, a little nearer together; between these 4 the vertex is sometimes suffused with rosy, the tint encroaching a little dorsally also. Pronotum greyish-rosy. Scutellum rosy with 3 testaceous spots, 2 anteriorly subcontiguous and one posterior. Tegmina pale olive testaceous, more or less greenish-iridescent, a little smoky at the base internally. Clypeus laterally sinuate, broader apically than at the base.

*Male*: tergites and valve more or less rosy, the latter transverse, sinuate.

*Female*: pygophor long, but much shorter than the ovipositor.

Length 5½ mill.

Hab. Queensland, Kuranda (Aug., P.).

N. B. The rosy hue may be entirely absent.

### 2. *nymphias* sp. nov.

Greyish testaceous, vertex ventrally with 2 small spots anteriorly, almost concealed by pronotum. Scutellum with 2 small wedge-like spots anteriorly, partly concealed by the pronotum. Veins of corium sanguineous (sometimes brownish).

Length 3½ mill.

Hab. New South Wales, Sydney (Jan., K.), Mittagong (Jan., K.), Koebele's No. 2356, on *Melaleuca*.

### 3 *orcias* sp. nov.

Differs from the preceding by the brownish fuscous tegmina which have 2 larger and one smaller translucent spots at the middle in a transverse row, the innermost being on the clavus.

Length 3½ mill.

Hab. New South Wales, Mittagong (Jan., K.), in poor condition.

### 4 *orodemnias* sp. nov.

Form of *xantho*, but the base of the pronotum is slightly emarginate. Head, pronotum, scutellum and sterna greenish testaceous, much discoloured, especially on the head. Tegmina hyaline cinereous, a blackish or dark fuscous spot at junction of clavus, corium and membrane, and another at the apex of the basal part of the subcostal cell; veins greenish testaceous, partly suffused with dark fuscous. Legs greenish testaceous. Tergites dark fuscous at least laterally.

*Female*: last sternite subtruncate, pygophor pale reddish-brown, ovipositor dark.

Length 4½ mill.

Hab. Queensland, Kuranda (Aug., P.).

### 5 *xantho* sp. nov.

Head, pronotum, scutellum and sternites yellow or orange-yellow. Sterna and legs yellowish testaceous. Tegmina hyaline, subiridescent, tinged with cinereous, a darkish fuscous longitudinal stripe down the middle of the tegmen and a fuscous spot at the apex of the clavus.

*Female*: last sternite subtruncate.

Length 4-4¼ mill.

Hab. Queensland, Kuranda (Aug., P.).

### 6 *hylcorais* sp. nov.

Pl. II, figs. 1-2.

Like *aulonias*, but smaller and narrower; a somewhat elongate zigzag smoky line down the middle of the tegmina.

*Female*: last sternite subtruncate, slightly notched in the middle.

Length 4⅞ mill.

Hab. Queensland, Bundaberg (Sept.-Dec., K.).

### 7 *cupido* sp. nov.

Form of *xantho*. Head, pronotum, scutellum and underside pale yellowish often suffused with rosy. Tegmina pale yellowish testaceous suffused with rosy, veins rosy; subcostal cell, apical cells, apex of subapical cells and appendix, hyaline.

Length 3 mill.

Hab. New South Wales, Sydney (Jan.-Feb., K.).

### 9 *napais* sp. nov.

Pale testaceous, more or less tinged with green, immaculate. Eyes reddish-black. Tegmina hyaline, subcostal etc. greenish.

*Male*: pygophor long, narrow, apically acute, turned outwards a little.

Length 6½ mill.

Hab. Queensland, Bundaberg (Nov., P.).

### 10 *aulonias* sp. nov.

Close to *kisseis*, but pale creamy-grey in general colour, though it may be more or less rosy or reddish. There are no head spots.

*Male*: valve triangularly notched in the middle; pygophor broader than in the last, ovipositor not so long as in the last.

Length 5⅛ mill.

Hab. Queensland, Cairns (Aug., P.); Bundaberg (Sept.-Dec., K.).

### 11 *nereias* sp. nov.

Pale greyish-yellow, more or less suffused with orange, subiridescent. Eyes fuscous. Head and eyes much wider than, and strongly decumbent on, the pronotum, vertex dorsally about as wide in the middle as at the eyes, gently rounded anteriorly. Frons rounded in profile, clypeus wider apically than at the base. Tegminal veins very feeble.

*Female*: last sternite slightly emarginate roundly.

Length 3¾ mill.

Hab. New South Wales, Sydney (Jan.-Feb), Parramatta (Jan. K).

12—sp. nov.

One immaturely coloured example from Mittagong (Jan. K) of a new species.

### *Ipo.*

1. *ambita.*

Posterolateral margins of frons straight, ocelli at about the middle of each side; lora and clypeus touching the reflexed hind margin of the genae. First subapical cell longer than the second. All these details are very similar in *I. conferta.*

3. *honiala.*

Posterolateral margins of frons sinuate.

4. *aegrota*

Posterolateral margins of frons straight.

5. *pompais*, sp. nov.

Form of *I conferta* but smaller and paler. Pale testaceous, strongly, minutely and closely spotted with brownish fuscous; frons (and usually a thin longitudinal line from frons to base of pronotum) pale testaceous. Scutellum pale ferruginous, antero-lateral angles dark fuscous. Tegmina hyaline tinged with cinereous, suffused and mottled with light and dark fuscous; an undulating transverse narrow whitish stripe near the middle; extero-apical part of tegmina almost immaculate, one or two whitish spots near the commissure. Beneath brownish testaceous. Head nearly truncate anteriorly. Eyes projecting laterally distinctly farther than the pronotum.

*Male*: last segment roundly emarginate, pygophor subconstricted near the base.

Length 5 mill., breadth 2½ mill.

Hab. Queensland, Nelson (July P).

## *Macropsis.*

*Macropsis* Lewis 1835 T. E. S. London I. 49 (div. A.)
=*Pediopsis* auctt. (part).

The four Australian species may be separated as follows:

1 Only two subapical cells (the third being merged in one of the apicals) ....................................1 *oeroe*

1a Three regular subapicals ........................(2)

2 Tegmina pale, unornamented..................2 *thymele*

2a Tegmina with many dark markings................(3)

3 Face evenly rounded; pronotum immaculate except for the punctuation ...................................4 *thoantias*

3a Face unevenly raised in parts; pronotum with a sublateral dark line .......................................3 *thyia*

### 1. *oeroe*, sp. nov.

Head, pronotum and scutellum pale ochraceous, closely and finely punctured with purplish-brown. Tegmina hyaline, pale yellow brown, veins (except the subcostal) dark fuscous, multi-annulate with whitish, apical cells and tergites more or less fuscate. Sternites paler. There are only 2 subapical cells; the 1st apical is very small and the second is long, touching the base of the first subapical. (This is a constant character in 8 specimens).

Length 3½ mill.

Hab. Queensland, Kuranda (Aug., P.), Nelson (July P.).

### 2. *thymele*, sp. nov.

Close to the last but the punctures are fainter, and the anterior half of the pronotum is lightly keeled or at least there is a smooth line there. Tegmina pale yellowish-hyaline, nervures weaker, concolorous, a fuscous speck at apex of sutural cell, another at apex of clavus; a transverse vein in the subcostal, and the 1st subapical vein, &c., fuscous. There are three subapical cells.

Length 4 mill.

Hab. Queensland, Bundaberg (Sept. -Dec. K).

### 3. *thyia*, sp. nov.

Resembles the first, but more ornate and there is an entire smooth line on the pronotum. The face, unlike the 3 others, in which it is regularly rounded, is unevenly raised or ridged in parts. Pronotum with a curved broken longitudinal blackish-brown sublateral line. Tegmina hyaline, strongly punctured with fuscous, the punctures rendering the clavus and base of corium opaque; an irregular band across the tegmina and the apical sixth dark greyish-fuscous, veins fuscous multiannulate with whitish. Legs testaceous closely speckled with fuscous, tibiae multiannulate with whitish. There are 3 subapical cells.

Length 3½ mill.

Hab. Queensland, Kuranda (Aug.P).

### 4. *thoantias,* sp. nov.

Resembles the last, but the face is not ridged and the pronotum is immaculate with dark punctures. Tegminal pattern more obscure, a dark line across the base. There are 3 subapical cells.

Length 3½ mill.

Hab. New South Wales, Sydney (Jan. K).

## *Epipsychidion.*

According to the horismology now used, the tegmina have 3 subapical and 4 apical cells, and the subcostal is divided apically by an oblique vein.

### 1. *epipyropis.*

(Bull. I p. 346, Pl. XXIII, figs. 4-6.)

*Female.* The second subapical cell extends further apically than the others. Last sternite truncate. The figure of the adult (fig. 4) does not show the crossveins.

*Male.* What is probably the male of this species has a rounded head, a little longer at the eyes than in the middle. Pale yellowish testaceous, mottled and spotted rather obscurely with pale brownish cinereous, veins not annulate. Vertex and pronotum without black lines, but with traces of pale longitudinal lines. Last sternite roundly emarginate, plates elongate.

Length (males) 5¼ (females) 6½ mill.

Bred from nymphs on *Leptospermum.*

## *Alseis* gen. nov.

Vertex very declivous, dorsally very short, wider laterally than in the middle; eyes touching the base of the tegmina. Frons suboval, basally extending beyond the apical margin of the vertex; antennal ridges straight, entire, nearly as wide as frons. Vertex and pronotum transversely striate. Ocelli on a line with the insertion of the antennae and the base of the frons, not touching the latter.

### 1. *osborni*, sp. nov.

Whitish-testaceous, very finely mottled with brown, spotted with dark fuscous, a large suffused fuscous inverted arrow on anterior part of pronotum. Tegmina irregularly mottled and spotted with fuscous. Fore and middle legs blackish-brown, obscurely spotted with pallid; hind legs fuscous, obscurely marked with darkish.

Length (female) 8¾ mill.

Hab. Queensland, Brisbane (June P), Kuranda (July P).

## *Oncopsis.*

*Oncopsis* Burmeister 1838 Gen. Ins. I, Bythoscopus, 3rd page. =*Bythoscopus* auctt.

### 1. *balli*, sp. nov.

Bright yellow, closely punctured with brown on head and pronotum. There is a laevigate horse-shoe mark on the face near the clypeus, broken at the base, and there are 2 smooth pits nearer the base of the face. There is also a small smooth area on the pronotum on each side anteriorly, and the striation is fine and somewhat reticulate. The scutellum is punctured closely only on the disk. Apical margins of clypeus and genae, marks on legs, sterna, &c., blackish. Tegmina cinereous hyaline, a blackish smudge near the base, veins strong, yellowish brown, sometimes blackened.

The head is not visible dorsally, except close to the prominent eyes, nor is the anterior margin of the pronotum visible.

Length 5 mill.

Hab. Queensland, Bundaberg (Sept.-Dec. K.).

I have great pleasure in naming the last two species after Professors Osborn and Ball, whose work, conjointly or separate, on the Homoptera, especially the genera *Deltocephalus*, *Agallia*, &c., forms a model for future research.

### *Eurinoscopus.*

The Australo-Fijian species may be disposed as follows. This is a very difficult genus and I have been unable to deal satisfactorily with several specimens, including Muir's Nos. 112 and 157; the latter were off native trees and were heavily stylopized.

1 Pronotum and tegmina freckled with brown......(2)
1a Pronotum, at least, immaculate....................(4)
2 Face spotted with black, tegmina strongly freckled.... ......................1 *lentiginosus* (Pl. II, figs. 7-8)
2a Head immaculate, tegmina more faintly freckled....(3)
3 Smaller, darker, frons less flat, &c.........2 *sontiates*
3a Larger, paler, frons flatter ....................3 *soboles*
4 Tegmina cinereous, punctured with brown..8 *hamadryas*
4a Tegmina yellowish or green .......................(5)
5 Tegmina with brown freckles..................4 *dryas*
5a Tegmina not freckled ...........................(6)
6 Uniform pale brownish yellow ..............7 *pelamys*
6a Bright green, head and scutellum, &c., often yellowish (7)
7 Head dorsally as wide laterally as in the middle..5 *pelias*
7a Head dorsally distinctly wider in the middle than laterally ........................................... 6 *molestia*

### 8. *hamadryas,* sp. nov.

Cinereous, lora and clypeus often infuscate. Pronotum usually clouded with fuscous, the posterior angle usually broadly blackish. Tegmina with fuscous veins and obscure fuscous puncturation. Legs more or less fuscous.

Length 4¼-4½ mill.

Hab. Viti Levu, Rewa (March & Nov. M).

### Tribe Phrynomorphini.

The genera in this are very hard to limit and define, and they are not always altogether natural. It is probable that future classifications will be based largely upon nymphal characters. A number of groups may be formed, but cannot be altogether satisfactorily limited, for instance, the genera with the anterior margin of the vertex deeply and completely channelled transversely, merge gradually into those with simple head; these again merge into those with foliaceous or acute anterior margin of the vertex.

The venation is also often irregular, the characterization of the *Deltocephalus-Phrynomorphus-Thamnotettix* group being in especial confusion. The extra-Oceanian material at hand for comparison being entirely inadequate, I have preferred not to make more new genera than could be helped; at the same time it is doubtful whether the recognized authorities on Cicadoidea (for instance, Osborn, Ball, Van Duzee, or Melichar) would accept the generic positions I have assigned to some of the species, or would agree among themselves. The difficulty of sharply limiting these genera is evident from the synonymy of several species, according to these various authors, during the past twenty years, ex. gr. *Deltocephalus osborni, Athysanus seminudus, Limotettix striola,* and *Thamnotettix striatula.*

The study of the Phrynomorphini is not lightly to be undertaken, but, more necessarily perhaps than in any other Cicadoid group, the known species of the world must be revised by some competent Hemipterist. It would be an immense advance in the knowledge of the group, if Osborn & Ball, whose studies on the North American forms have formed a model for future work, would undertake this task. The nymphs usually present very important specific characters, as these authors have shown, but in some genera at least, the number, colour, and disposition of the abdominal bristly hairs is specifically very valuable, a character neglected up to the present.

### *Stegelytra.*

It is evident that two quite different genera are confused under this name; they may be separated as follows:

(a) Vertex anteriorly rounded, angulate in profile; pronotum anteriorly arched, posteriorly slightly emarginate. Tegmina with 2 subapical cells .................*Stegelytra* (type *alticeps.*)

(b) Vertex anteriorly subangulate, almost porrect in profile; pronotum anteriorly truncate or subtruncate between the eyes, posteriorly truncate between the scutellar angles. Tegmina with 4 subapicals, apicals reticulate.......*Iberia* nov. (type *bolivari*).

### *Thomsonia.*

#### 3. *kirschbaumii.*

Add to localities: Bundaberg (Sept.-Dec., K.).

### *Hybrasil* gen. nov.

Closely allied to *Thomsonia.* Head strongly and completely channelled on top, clypeus somewhat constricted at base. Pronotum regularly roundly arched anteriorly. Tegmina with 2 subapical cells and 5 apicals, the first being in a line with the subapicals, the fifth very large. Valve present in the male.

#### 1. *brani,* sp. nov.

(Pl. II, fig. 18).

*Male*: vertex, pronotum, scutellum, antennae, legs and pleurites pale yellowish green, including the channel on the top of the head; frons and a very narrow border on the vertex basal of the channel, sterna and abdomen, black. Tegmina pale smoky-yellowish, hyaline, with a median smoky smudge down the middle; veins more or less suffused with fuscous, except the pallid subcostal, radial and claval veins. Wings smoky, veins dark. Valve very short, plates pale, together triangular, then suddenly acuminate and produced apically, not as long as pygophor.

*Female*: head entirely pale yellow, except for 2 narrow black lines on either side of the channel. Underside pale yellow. Tegmina less fuscate than in the male. Seventh segment truncate, pygophor broad, not as long as ovipositor.

Length (male) 4½ (female) 6 mill.

Hab. Viti Levu, Rewa (Mar. Muir).

### *Dryadomorpha.*

In the unique type of *D. pallida,* it was not possible to interpret the obscure venation, but apparently there were no cross veins in the subcostai. Mr. Muir has collected a species at Rewa which I place here. The venation is somewhat like that of *Platymetopius;* there are two discoidals, the medians being nearly twice as long as the exterior and extending beyond it basally and apically; there are 5 or 6 cross veins towards the apex of the subcostal, and 5 apical cells and an appendix. The wing cells are also peculiar.

#### 2. *lotophagorum*, sp. nov.

Greenish-yellow, head and pronotum more or less mottled with light fuscous, some more regular, rather darker, spots on the lateral margin of the vertex anteriorly and on the lateral margins of the frons. Tegmina pale yellowish hyaline; interior half, obliquely, of membrane, and the appendix, pale smoky; apical vein sordid whitish; three dark fuscous spots on the commissure; apex of last apical cell acute, with a smoky spot. Legs pale brownish testaceous, speckled with black granules. Sternites greyish-fuscous. Lateral margins of pronotum acuminate behind the eyes.

*Male*: last segment very slightly roundedly emarginate.

*Female*: last segment obtuse-angulately emarginate medianly; pygophor rather swollen laterally in the middle, flattish.

Length 6-7 mill.

Hab. Viti Levu, Rewa (Mar.-Apr. Muir).

### *Tortor* gen. nov.

Probably allied to *Dryadomorpha;* the vertex is however not depressed and is more rounded anteriorly.

Vertex flattish, slightly raised towards the middle from the lateral margins, about as long as wide across the small eyes, lateral margins converging anteriorly, apical margin roundly angulate. Frons concave, raised laterally, clypeus more or less fused, lora minute. In profile the head is thin, the lateral margins are flattened, narrowing apicalwards; ocelli very indistinct rudiments on this flattened part, at about half the length of the head. Pronotum transverse, about three-fourths the length of the vertex, longer than the scutellum. Tegmina elongate, subcoriaceous, veins very indistinct; the radial appears to be undivided almost till the apex of the tegmina, while the median is joined to cubital at least 5 or 6 times by short, transverse veins.

#### 1. *daulias*, sp. nov.

Pale golden yellow. Eyes greyish.

Length 9 mill.

Hab. Queensland, Bundaberg (Sept.-Dec.).

The nymphs are not remarkable, being in general form and colour like the adults.

### *Tartessus.*

This is evidently a large genus, as 15 species are now known from Australia alone. The forms described form three groups:

(a) Veins of tegmen dark multiannulate with white; *T. ianassa*.

(b) Veins unicolorous yellowish or brownish, sometimes more or less fuscate, divided into:

(c) face wholly, or in large part, blackish; *T. io, iphis,* and *fulvus* (part).

(cc) face wholly, or in greater part, pale; *T. ianeira, ianthe, iambe, io, iphis, issa, itonias, idyia* and *fulvus* (part).

### 1. *fulvus.*

*Bythoscopus fulvus* Walker 1851 List. Hom. 866
*Tartessus australicus* Spangberg 1878 O. V. A. F. XXXV, I.
*T. fulvus Signoret* 1880 A. S. E. France 348 Pl. 9 fig. 74.
var. *T. syrtidis* Kirkaldy 1906 Bull. H. S. P. A. Ent. I, 341 Pl. 24 f. 9.

This is a variable species; a single female from New South Wales, Sydney (Jan.) seems to agree with Signoret's description and figures, except that the eyes in Signoret's figure of the insect, are represented as not very decumbent on the pronotum and far from contiguous with the base of the tegmina. Beside this there are 4 males (not females, as wrongly stated in the description) of the var. *syrtidis,* a series of males and females very like the type, but differing in the colouring of pronotum, &c., (i. e., the presence of 5 or 6 brown spots along the anterior margin) and in the colour and pattern of the frons; it is unnecessary to bestow on them a varietal name. The figure of the face (l. c., Pl. 24, f. 9) of var. *syrtidis* gives a false impression (and refers rather to the type) as the whole of the face is black except narrow lines on the frons, and the antennae. The venation varies very little, sometimes there are 2 or 3 crossveins in the sutural area, sometimes these are absent. Subcostal cell divided by a somewhat oblique transverse vein about the middle, a little variable, of the first subapical (sometimes by 2 close together.) The 3 subapical cells extend apically about equally far.

Hab. New South Wales, Sydney (Jan.); Queensland, Cairns (Aug.).

var. *syrtidis*, Bundaberg (type, Oct.) Cairns (July) and Sydney (Jan.) bred from *Eucalyptus*, on Sandhills.

The genitalia appear identical in these forms, nevertheless I should have retained *syrtidis* as a good species, had not Dr. Perkins taken a male with a female of the second variety and a male of the second variety with a typical female *fulvus*. It is exceeding common, and is one of the few leafhoppers that can be considered as a pest of *Eucalyptus*. It is parasitized extensively in the ova-stage by *Pterygogramma acuminata* and as an nymph by *Chalcogonatopus gigas*. Nymphs of this or an allied form are parasitized by *Prosanteon chelogynoides* and *Pipunculus picrodes* and *cruciator*.

### 2. *idyia*, sp. nov.

Black; base of vertex and basal half of posterolateral margin of scutellum, pale yellow; a narrow line on the genae contiguous with the lateral margin of the frons, a similar one on the pronotum contiguous with the posterior margin of the eyes, a tiny wedge at anterolateral angles of scutellum, pale ferruginous; labium, fore and middle legs (except basal two-thirds or more of femora) testaceous. Tegmina subhyaline, tinged with ferruginous, veins (somewhat suffusedly in most of them), median third or more of subcostal cell, blackish; basal two thirds of antesubcostal cell, whitish subhyaline. Vertex rounded apically, strongly striate transversely, formed as in *T. fulvus*, but a little more prominent anteriorly. Eyes as in *T. fulvus*. Frons basally strongly striate transversely, apically aciculate punctate. Genae with the apical margin less oblique than in *T. fulvus*, and clypeus shorter than in that species. Tegminal venation much as in *T. flavipes* but the cross-vein on the brachial near the base, and that towards the apex of the subcostal cell, are straight, not oblique; there are no cross veins in the clavus. Second subapical cell extending apically beyond the others.

*Male*: genital segments apparently much as in *T. pulchellus* but in all the specimens they are rather shrivelled.

Length 5½ mill.

Hab. Queensland, Nelson (July) type, Cairns (Aug.).

### 3. *itonias*, sp. nov.

Apparently allied to *T. pulchellus*, but differing by the form of the genitalia and by the vertex being obtuse-angular. Face immaculate, borders of the pieces rather more obscure, lateral margin of frons fairly straight. Sterna and sternites testaceous. Venation similar to *pulchellus*, but the median (inner discoidal) cell is longer, the crossvein in the subcostal straight; the first subapical cell is very wide apically, consequently the apical part of the subcostal is very narrow and acute; subapical cells extending about equally far apically.

Length (male) 8¾ mill.

Hab. Queensland, Cairns and Kuranda (Aug.).

### 4. *issa,* sp. nov.

Superficially like the preceding but the vertex is roundly angulate and wider at the eyes than in the middle. Appendix to tegmina about as large, faintly smoky narrowly bordered inwardly with hyaline. Subcostal cell much wider and is subparallel beyond the transverse vein, apical margin oblique. Subapical cells extending about equally far apically.

*Male*: tegmina slightly suffused, veins partly dark. Genital segment not unlike *T. flavipes,* but slenderer and more elongate.

*Female*: tegmina not suffused, veins pale. Genital segments elongate, slightly, obtuse-angularly produced in the middle; pygophor elongate, but much shorter than the ovipositor.

Length 6 (male) 8½ (female) mill.

Hab. Queensland, Nelson (July) Kuranda and Cairns (Aug.).

In a female from Kuranda the crossvein at the base of the inner subapical vein is absent on both tegmina.

### 5. *iphis,* sp. nov.

*Male*: vertex luteous, suffused (except basally) with sanguineous. Frons pale luteous suffused with sanguineous, a curved blackish band contiguous to the apical margin of the basal part of the frons; median third of length suffused with fuscous, with curved concentric fuscous lines extending over the yellowish-red ground colour. Genae (excluding a part of the apical margin very narrowly), clypeus and lora blackish. Pronotum and scutellum (except posterior third of latter which is paler) orange-yellow. Tegmina pinkish brown, veins somewhat fuscate, some of them dark fuscous; commissure blackish; apex of apical cells (except the first sometimes) and the appendix, smoky. Sterna and sternites blackish or subsanguineous. Fore and middle legs testaceous, hind pair blackish. Head rounded in front, frons basally and pronotum strongly striate transversely, frons aciculate. Crossvein on brachial sometimes absent; second subapical cell extending beyond at least the third; subapical crossvein oblique.

*Female*: like the male, but the vertex (excluding the pale greenish or luteous basal margin) is bright redbrown; face black except a small redbrown line on the genae on each side of the frons. Sterna and sternites mostly blackish. Pronotum and anterior two-thirds of the scutellum bright redbrown. Legs testaceous; fore coxae and hind coxae and femora blackish, hind tibiae subapically more or less widely fulvous or pallid. Tegmina dull ferruginous, hyaline subapically, marked as in the male. Last abdominal segment produced, apically subangular, ovipositor a little longer than the pygophor.

Length (male) 7, (female) 7½ mill.

Hab. Queensland, Nelson (July, type) Kuranda and Cairns (Aug.).

### 6. *io*, sp. nov.

Allied to *T. iphis*, but more robust and with different colour and pattern.

Head, pronotum and scutellum sordid yellowish, frons with a longitudinal submedian dark fuscous fascia (uniting basally acutangularly) with transverse, curved fasciae; sutures very narrowly, base of genae around insertion of antennae, clypeus apicolaterally, sterna and sternites mostly, dark fuscous or blackish. Tegmina pale ferruginous; hyaline, sublacteous on subcostal cell apical of the crossvein, and across the tegmina interiorly in the middle; veins mostly dark fuscous. Legs testaceous, base of femora (and the hind tibiae more or less) fuscous. Vertex scarcely rounded, wider at the eyes than in the middle. Frons elongate, lateral margins sinuate; clypeus strongly carinate. Pronotum strongly striate. Crossvein on brachial nearly straight, on subcostal oblique. Second subapical cell extending apically beyond the others.

*Female*: genital segments black, much as in *T. fulvus*, but last sternite more acute apically.

Length (male) 6½ (female) 7¼ mill.

Hab. New South Wales, Mittagong (Jan. K).

### 7. *iambe*, sp. nov.

Allied to the last, but stouter and not so elongate; paler, tegmina milky cinereous, immaculate, except an obscure fuscous spot in some of the cells, veins fuscous, apex of tegmina infuscate. Second subapical cell extending beyond the others apically; crossvein on brachial, nearly straight, in subcostal cell, oblique.

*Male*: pygophor pale ferrugineo-testaceous, with blackish bristles; plates elongate, apically acute.

*Female*: pygophor coloured as in the male, formed as in *T. io*, but not nearly so acutely or far produced in the middle.

Length 6-7 mill.

Hab. New South Wales, Mittagong (Jan. K).

This might be confused with *T. io*, but the stouter form and different genital segment abundantly distinguish it.

### 8. *ianthe*, sp. nov.

Pale sordid yellowish; vertex, pronotum and anterior two-thirds of scutellum closely spotted with pale yellowish, these spots being clearly but not deeply punctured. Face pale yellowish, obscurely marked with brownish. Pronotum and scutellum fuscate (sometimes the former on the disk only). Tegmina pale yellowish hyaline, immaculate, basal veins pale, apical ones subferruginous, appendix fuscate. Sterna and sternites mostly pale. Tergites blackish along the middle, pale laterally. Head rounded, nearly as long in the middle as laterally. Crossveins on brachial vein and in subcostal cell, straight; subapical cells extending apically about equally far, or the third not quite so far as the others; subcostal cell apical of the crossvein subparallel laterally, apically oblique.

*Male*: valve practically obsolete, plates not unlike *flavipes*.

*Female*: genital segments fulvescent above ,varyingly coloured beneath; last sternite strongly produced, apically acute, strongly carinate longitudinally, pygophor elongate (with yellowish bristles), about as long as the ovipositor.

Length (male) 8- (female) 11 mill.

Hab. Queensland, Brisbane (June), Cairns (July-Aug.).

### 9. *ianassa*, sp. nov.

*Female*: form of the last, but vertex more emarginate basally without being more produced anteriorly. Head, pronotum and scutellum marmorate with yellowish-white, pale yellowish-brown and brownish, paler on frons. Legs pale, femora and tibiae annulate with brownish. Tegmina yellowish brown, veins concolorous, crossveins suffused with dark fuscous; longitudinal veins (except subcostal and commissure), multiannulate with dark fuscous, appendix fuscate. Crossveins on brachial vein and in subcostal cell, oblique, the apical part of the subcostal apically elongate and acute, reaching nearly to the apex of tegmina; second subapical cell extending apically farther than the rest. Last sternite nearly truncate, pygophor elongate (with brownish ferruginous bristles), about as long as the ovipositor.

*Male*: narrower than the other sex. Pronotum not marmorate, brownish yellow with pale, subpunctate spots. Face nearly immaculate (except base of frons), legs almost so. Genital segments not unlike those of *Sarpestus specularis* in form, except that the apical margin of the last sternite is wider.

Length (male) 8- (female) 9½ mill.

Hab. Queensland, Cairns (July-Aug.).

### 10. *iancira*, sp. nov.

Allied to *T. iambe*. Pale yellowish brown, scutellum often tinged with ferruginous. Second subapical cell extending apically beyond the others. Crossveins on brachial and in subcostal fairly straight.

*Male*: sterna and sternites somewhat fuscate; face almost immaculate; genital segments not unlike those of *T. subniger*.

*Females* Frons with a submedian pale fuscous longitudinai line with transverse striae. Sterna and sternites pale; last sternite produced, apically acute-angled, pygophor elongate with yellowish-brown bristles.

Length 7 mill.

Hab. New South Wales, Sydney (Jan.-Feb. K), Parramatta (Jan. K).

### 11. *iokaste*, sp. nov.

Not unlike *T. ianthe*, but smaller, tegmina more pointed apically, head more angulate, &c. Pale sordid yellowish-brown, obscurely suffused here and there with green and sanguineous. Pronotum obscurely spotted. Veins sometimes dark fuscous, sometimes subferruginous. Vertex obtuse-angular anteriorly, longer at eyes than in the middle. Vertex, base of frons, and pronotum transversely striate. Second subapical, cell extending apically a little beyond the others. Crossveins on brachial vein nearly straight, oblique in the subcostal cell.

*Male* as in *T. ianassa.*

*Female*: last sternite straight apically, medianly rather deeply notched; ovipositor long, a little longer than pygophor.

Length 8 mill.

Hab. Queensland, Cairns and Kuranda (Aug.).

The following four species, unknown to me, have been described from Australia:

12 *T. subniger* Signoret, 1880, A. S. E. France (5) X 350, Pl. IV, f. 75 (*male genitalia*).

13 *T. sahlbergii* Signoret, op. c., 351, Pl. IX, f. 76.

14 *T. flavipes* Spangberg; Signoret 1880 op. c., 360, Pl. X, f. 85 (Tasmania).

15 *T. pulchellus* Spangberg; Signoret 1880 op. c., 362 Pl. X, f. 87.

## *Thymbris* gen. nov.

Allied to *Tartessus*, but the vertex is convex and although sharp anteriorly, is not channelled as in the latter. Head and eyes wider than the pronotum; ocelli nearly as far from apex of dorsal part of head as from eyes, on the extreme margin of the head just on the dorsal side, but owing to the declivity of the vertex, is not visible when the insect is horizontal. Eyes not touching base of tegmina. Vertex and pronotum striate transversely. Tegmina narrowed posteriorly, without an appendix.

### 1. *inachis*, sp. nov.

Pl. II, figs. 19-20.

*Female*: vertex, pronotum, scutellum and tegmina whitish testaceous mottled with brownish. Beneath obscure testaceous. Veins dull ferruginous-brown, multiannulate with whitish. Fore and middle femora and tibiae annulate dorsally with brownish. Vertex nearly rectangular medianly, longer than at the eyes. Frons elongate, tempora wide, antennal ridges strong. Labium reaching to the base of the middle coxae. Second subapical cell extending apically well beyond the others. Transverse veins on brachial and in subcostal cell, oblique, apical part of the latter apically acute-angled. Last sternite truncate, transverse, pygophor flattened basally, reaching a little beyond apex of tegmina, not so long as ovipositor.

*Male*: (of this species?) Head slightly roundly-angulate anteriorly, a little wider at eyes than in the middle. Last segment roundly emarginate, valves about twice as long, elongate triangular.

Length (male) 8- (female) 11½ mill.

Hab. Queensland, Brisbane (Nov., type), Bundaberg (Sept.-Dec., males, female).

### 2. *iphianassa*, sp. nov.

*Male*: allied to the last, but differs as follows:

Extreme base of frons pale yellowish white, bordered apically with blackish, narrowly. Tegmina not mottled, immaculate, veins more sparingly annulate with whitish. Legs not annulate. Vertex distinctly angulate, a little wider in the middle than at the eyes. Labium reaching to apex of middle trochanter. Last sternite dark fuscous, truncate, about one-fourth or one-fifth of the length of the pygophor, which widens out a little apically.

Length 8½ mill.

Hab. New South Wales, Sydney (Jan.)

## *Putoniessa*, gen. nov.

Vertex very short, rather longer at the eyes than medianly; margin between this and frons angulate, but the top is actually thickened and a little flattened, an obscure transverse, ventral keel at about the middle of the eyes, apparently forming the limit. The ocelli are on this thickened and flattened part, about as in *Thymbris*, and although ventral in aspect, are I think, on the "vertex." Frons narrow, elongate. Tempora wide, antennal ridges rather strong. Vertex and pronotum transversely striate. *Clypeus and genae strongly angulate, the apical part declivous.* Venation as in *Thymbris*, but the apical part of the subcostal cell is longer and reaches the apical margin of the tegmen.

### 1. *dignissima*, sp. nov.

Pale greyish cinereous mottled with fuscous. Face pale testaceous, frons and clypeus mostly dark fuscous, with pale specks. Tegmina hyaline, tinged with cinereous, mottled with light and dark fuscous; veins brownish, crossveins mostly whitish. Femora blackish, at least basally and dorsally, fore and middle tibiae annulated with dark fuscous at least dorsally. Sternites dark fuscous, apically bordered with testaceous, narrowly.

Length 8½-9½ mill.

Hab. New South Wales: Mittagong (Jan. K).

This form is a complete link between the "Jassidae" and the "Bythoscopidae" and points the way to the Stenocotinae. It is a melancholy satisfaction to name this in honour of the venerable Dr. Puton, on whom affliction has fallen so heavily.

### *Xestocephalus.*

*Xestocephalus* Van Duzee 1892 Tr. Amer. Ent. Soc. XIX 298.

A genus noted from America, Ceylon and Japan; I now add two species from Australia and three from Fiji.

Van Duzee has placed it near *Aphrodès,* but he has I think been led astray by the degradation of the wing-venation, which could surely arise independently. Its place seems to me to be near *Phrynomorphus.*

#### 1. *vitiensis,* sp. nov.

Pale yellowish brown, eyes dark fuscous. Tegmina irregularly, brokenly fuscomarmorate, 2 dark spots on the subcostal vein, one near the base and one near the apex of the clavus; one or two of the apical veins suffused at their apices. Wings hyaline, iridescent, veins pale yellowish brown. Subapical cells of tegmen all quadrilateral or 5-hedral, none triangular, the interior cell a little the smallest, exterior slightly smaller than the middle one. Submarginal wing-vein absent on the first fold of the wing.

*Female*: 7th segment obtuse-angularly emarginate; pygophor rather short, nearly as long as the ovipositor, with pale bristles.

Length 5 mill.

Hab. Viti Levu, Rewa (Mar., Muir).

#### 2. *pallidiceps,* sp. nov.

Yellowish-brown, paler beneath. Tegmina yellowish hyaline, faintly marked with pale cinereo-fuscous, the exterior fourth with 2 or 3 darker transverse lines and the apical margin pale smoky. Wings hyaline, faintly smoky, veins pale.

*Male*: last segment apparently roundly emarginate, valve scarcely apparent, plates elongate with concolorous bristles.

Length 2⅞ mill.

Hab. Viti Levu, Rewa (Mar., Muir).

### *contortuplicatus* var. nov.

Like the type, but there is a double line of warm brown from mid-vertex to mid-scutellum, lateral contortuplicate lines of the same colour on pronotum and two blackish brown transverse lines on anterior margin of head. Tegmina rather more marmorate.

Hab. Viti Levu, Rewa (Mar.-Apr., Muir).

### *decemnotatus* var. nov.

Pronotum with 10 white spots. Tegmina as in *contortuplicatus*.

Hab. Viti Levu, Rewa (Apr., Muir).

These varieties may prove to be good species, but I have seen only a single example of each.

### 3. *australensis*, sp. nov.

Like the last, but larger and yellower; tegmina with sparse brownish markings.

Length 3½ mill.

Hab. Queensland, Kuranda and Cairns (Aug. P).

### 4. *purpurascens*, sp. nov.

Head and eyes pitchy brown with a purple tinge, inner orbits narrowly pale. Ocelli pale, very conspicuous. Pronotum and scutellum dark ferruginous brown with a purple glint. Tegmina warm brown with a purple glint, a few irregular pale spots and specks, not corresponding on opposite tegmina. Wings pale smoky, veins fuscous. Labium and fore coxae pale, rest of legs mostly pale fuscous, hind tibiae purplish pitchy. Sterna sordid testaceous. Abdomen purplish pitchy.

*Female*: pygophor with yellowish brown bristles; last segment notched in the middle.

Length 3 mill.

Hab. Viti Levu, Rewa (Apr., Muir).

### 5. *sidnicus*, sp. nov.

Blackish-brown; legs pale brownish-testaceous, the hind tibiae with a blackish apical annulus and the apical half of the first and the whole of the second segment of the hind tarsi blackish. Tegmina fuscohyaline, veins blackish, 2 or 3 thin, curved transverse, fuscous lines on the apical fourth of the tegmina. Ocelli orange-brown. Vertex roundly angular in front, one-half longer in the middle than at the eyes.

Length (male) 3¼ mill.

Hab. New South Wales, Sydney (Jan., K.).

## *Eutettix*.

### 1. *sellata*.

Matsumura (1905 Tr. Sapporo N. H. S., I, 20), thinks this is a synonym of *Acocephalus discigutta* Walker, a hazardous proposal without seeing the type. Walker's species was from Borneo, and Matsumura has added China and the Philippines.

### 2. *melaleucae*, sp. nov.

Whitish (tinged with yellowish sometimes on vertex and scutellum), minutely speckled with dark fuscous. Tegmina with most of the veins pale yellowish-brown on head, face, nota, tegmina and legs, the apical ones darker, part of the apex narrowly suffused. Lora remote from the apical margin of the genae. Vertex more rounded and a little shorter than in *E. sellata*, nearly twice as wide as the length. Claval veins united near the base by a cross vein, the anal vein slightly curved, meeting the commissure at an acute angle.

*Male*: valve short, transverse.

*Female*: apical margin of last sternite sublaterally emarginate, also minutely emarginate medianly. Pygopher about 3 times as long as last sternite, bristly, widened a little near the base, but narrowing at the base.

Length 4½ mill.

Hab. Queensland, Cairns (July), Nelson (July), Bundaberg (Sept.-Dec.) on *Melaleuca*.

## *Nephotettix*.

All palaeogaeic species.

1 Head and nota not green............................(2)

1a Greenish-yellow; males usually with a black spot on the corium .................................... 4 **apicalis**
2 Tegmina pale yellowish green grey.............. 1 **eurytus**
2a Tegmina not tinged with green........................ 3
3 Blackish line on vertex straight (or very obtusely-angulate) ......................................... 2 **plebeius**
3a Blackish line on vertex arched parallel with the anterior margin ................................ 3 **contemptus**

*eurytus*, sp. nov.

Pl. II, figs. 5-6.

Yellowish testaceous, browner beneath. Tegmina pale yellowish green grey, subopaque, immaculate; membrane subhyaline, pale yellowish, smoky. Vertex a little shorter than the pronotum, about as wide as the eyes together, disk depressed, anteriorly obtusely rounded, a little tumid medianly, a very narrow straight transverse channel between the ocelli. Tempora wide; clypeus a little narrower at base than the apex of the frons, a little constricted immediately apical, thence widening more to the apex. Genae sinuate apically, scarcely angulate laterally, apex of lora practically contiguous with the apical margin of the genae.

Length 5½ mill.

Hab: New South Wales, Mittagong (Jan.) one rather damaged female.

2. *plebeius*.

Pl. II, figs. 3-4.

Hab: add Viti Levu, Rewa (Mar., Muir).

4. *apicalis*.

Pl. II, figs. 11-13.

=*Cicada bipunctata* Fabr. 1803 Syst Rhyng........................................(nec. Scopoli 1763.) (=male.)
=*Pediopsis apicalis* Motschulsky 1859 Etud. Ent. 110................................................(=female.)
=*P. nigromaculatus* Motsch. op. c., 111 (=male.)
=*T. nigropicta* Stal 1870 O. V. A. F., XXVII 740 (=male).

=*Selenocephalus cincticeps* Uhler 1896 P. U. S. N. Mus., XIX, 292.

Hab: Queensland, (Cairns), Philippines, Riukiu, Formosa, China, Cochin China, Japan, the Malays, (Borneo, etc.), India, Ceylon, Madagascar, German East Africa, Egypt and Morocco on *Oryza sativa* and grasses.

On page 331 (of my former bulletin) I remarked that several species had been confused and indeed, if all the forms before me are one species only, it is very variable. Usually the tegmina are immaculate in the female, and with a large blackish blotch on the corium in the male; sometimes however the tegmina are immaculate in the male, there being gradations between. The genital segments are pale in the female, black in the male; they are however, partly pale in the immaculate males. There is usually a transverse, entire, black line between the ocelli; sometimes this is absent, as in 2 Sinhalese females in my own collection, but it is always present in the long Australian series before me. The frons varies from almost entirely piceous to almost entirely testaceous. The vertex is usually obtusely rounded, it is sometimes however, distinctly angulate.

### *Soracte* gen. nov.

Probably nearest to *Platymetopius*, but the head is not so elongate, the tempora much narrower, the clypeus wider, the lateral margins of pronotum obsolescent and the venation different.

Vertex produced in front of the eyes, apically obtuse-angled, but not quite so long as the maximum width, disk somewhat depressed. Angulate in profile, the ocelli (which are large but flat and probably not functional) close to the eyes on the sharp margin itself. Frons broad, slightly narrowing apically, lateral margins feebly rounded, tempora almost obsolete. Genae sinuate, lora remote from their apical margin. Clypeus broad, narrower than the apex of the frons. Pronotum a little shorter than the vertex, finely striate transversely, acute-angled laterally. Scutellum wider than long. Claval suture longer than the mebrane, the latter with an appendix.

### 1. *apollonos*, sp. nov.

Brownish-olivaceous; anterior margin of vertex, an upright cross on the same, the lower limb dividing into 2 almost contiguous limbs, 4 longitudinal lines (a submedian and a sublateral on each side) and a median T-shaped line on pronotum, 7 spots on scutellum (2 with an olivaceous speck each in the middle); a median line and numerous concentric, curved, transverse lines on frons; genae, clypeus, and lora (except some olivaceous-brown markings), pale yellowish-testaceous. Abdomen beneath mostly dark olivaceous brown. Tegmina subhyaline, tinged with olivaceous, veins widely colourless, margined narrowly with dark olive brown, sometimes a little suffused, especially the middle apical cell.

*Female*: last sternite roundly emarginate, the sides bluntly prominent. Pygopher elongate, narrow, with blackish bristles.

Length 4⅜ mill.

Hab: Queensland, Cairns, (Aug., one female.)

## *Deltocephalus.*

This seems to be characterized by a long, pointed vertex, frons longer than wide, tempora narrow, often obsolete basally, venation more complex.

### 2. *lotis,* sp. nov.

Vertex piceous with a thin median longitudinal testaceous line, basal half testaceous with two big piceous spots, a short transverse testaceous line on middle of apical half. Face piceous, frons with curved concentric lines on each side of the middle, irregular apically. Legs mostly piceous, fore and middle tibiae testaceous, suffused irregularly with piceous. Tegmina testaceous subopaque, with narrow piceous margins to the veins on both sides. Abdomen above piceous with about 5 rows of testaceous spots, below mostly piceous. Greatest width of vertex about the same as the length, vertex flattish, nearly rectangled apically, a little depressed basally. Vertex and frons acute-angled in profiile. Tegmina reaching to about half the length of the insect, obliquely transverse apically.

Length 3⅝ mill.

Hab. New South Wales, Mittagong (Jan. K.) one female.

### 3. *D. polemon,* sp. nov.

Closely allied to *D. sylvestris* Osb. & Ball, but venation and genital segments different.

Vertex testaceous, with a faint olivaceo-fuscous stripe on each side of the median line, terminating apically in a fuscous speck. Face piceous, frons with 5 or 6 thin, concentric, curved, inwardly abbreviated pale yellowish-brown lines. Pronotum testaceous, with 3 longitudinal pale olive-fuscous stripes on each side, the innermost broad and continuing on to the scutellum. Tegmina dilute yellowish cinereous, veins whitish testaceous, narrowly and irregularly margined with fuscous, apical cells mostly dark fuscous, the first and second apical veins whitish. Sterna and abdomen mostly dark fuscous or piceous, marked with pallid.

*Male*: valve short, triangular; plates little longer than the valve, the two taken together deeply emarginate angularly in the middle; pygophor more than twice as long medianly as the plates.

*Female*: last sternite roundly emarginate, bluntly angulate at the sides; apex of pygophor pale, with particoloured bristles (yellow and dark fuscous.)

Length 3½ mill.

Hab. Queensland, Cairns, (Aug.)

Sometimes the vertex and pronotum appear as though pale olivefuscous with pale lines.

### 4. *histrionicus*, sp. nov.

Vertex, pronotum and scutellum yellowish creamy, underside and tergites with a brownish tinge; anterior margin of head with two intersecting black curves; anterior two-thirds of pronotum (except laterally) suffused with ferruginous, a broken, angular, fuscous line at the base of this suffusion. Scutellum with a ferruginous spot at each anterolateral angle. Tegmina pale creamy whitish, tinged with ferruginous along the corial half of the clavus and on most of the apical half of the corium; subcostal cell yellowish creamy with the following dark fuscous markings, viz: a St. Andrew's Cross on the basal two-thirds (the basal right and apical left limbs being irregular) subcostal cell with 3 elongate spots, the third uniting with the St. Andrew's Cross; on the apical third there is an oblique sinuate line from near the apex of the clavus to near the apex of the subcostal, then curving round the apical margin, nearly reaching its starting point and enclosing a large spot. Wings hyaline, veins pale.

*Female*: last segment slightly notched medianly, pygophor yellowish, apically marked with black.

Length 3⅛ mill.

Hab. Viti Levu (Mar. Muir's No. 143), on a native tree in the bush.

### 5. *lucindae,* sp. nov.

*Male*: white tinged with yellowish brown; frons with a dark suffused radiating pattern visible dorsally as 2 oblongs and 2 specks on the anterior margin of the vertex; margins of face brown. Pronotum and scutellum obscurely mottled. Legs annulate. Tegmina much as in *Conosanus hospes*. Abdomen beneath pale medianly, dark laterally. Valve pale, very large, semicircular, nearly as long as the plates, which are apparently about as long as the pygophor.

*Female*: (of this?) darker and more suffused. Abdomen below dark fuscous. Last segment deeply roundly excavate, pygophor dark speckled with pale, a little longer than the ovipositor.

Length (male) 3⅞ (female) 5 mill.

Hab. Queensland, Lucinda (July K).

### 6. *flavidiventris*.

*Jassus* (*Deltocephalus*) *flavidiventris* Stal 1859 Eugenies' Resa Ins. 294.

I do not know this species, laconically described from Sydney.

I agree with Van Duzee that his *Deltocephalus osborni* belongs to this genus and not to *Phrynomorphus*, as is indeed apparently the case with all the species placed by Osborn & Ball in *Commellus.*

## Phrynophyes.

*Phrynomorphus fatigandus* cannot be placed in *Phrynomorphus* as restricted, it is nearer *Phrynophyes*. The elongate frons, vertex longer than wide and acuteangled apically, remove it from *Phrynomorphus* (even *sens. lat.*), while the venation is too simple for*Deltocephalus*. It has the characters somewhat of *Stirellus* but is very different from *S. curtisii*, the only species I have for examination; moreover *Stirellus* seems to merge gradually into *Deltocephalus*.

## *Driotura*.

*Dritotura* O. & B., 1898, Proc. Davenport Ac. Nat. Sc. VII, 87.

### 1. *aristarche*, sp. nov.

Pl. II, figs. 9-10.

Probably allied to *D. robusta* O. & B.., but the head is longer and more angulate, and the tegminal reticulation coarser.

*Male*: vertex whitish-testaceous, heavily barred with piceous. frons whitish-testaceous, with curved concentric lines, which are much broader than the interstitial paleness; genae, clypeus and lora whitish-testaceous with a large dark fuscous spot on each. Anterior half of pronotum dark fuscous with a few tiny testaceous markings, posterior half whitish. Tegmina fuscous, veins margined both sides with piceous, apical margin broadly whitish. Fore and middle femora piceous, multi-annulate with testaceous, hind femora testaceous with irregular, longitudinal, fuscous stripes. Abdomen piceous with 4 or 5 rows of tiny testaceous specks, last tergite with the apical margin whitish-testaceous.

*Female*: head testaceous, suffused with pale fuscous. Vertex not quite as long as wide, angulate, a large dark fuscous spot on each side of the middle near the base, and interior to these a short dark fuscous line on each side a little anterior. Pronotum whitish, anterior half testaceous with fuscous markings. Tegmina whitish varying to fuscous with white apical margin. Abdomen above fuscous and whitish testaceous, almost irrorate. Abdomen below dark fuscous with a few testaceous markings. Frons brownish testaceous with dark fuscous curved concentric lines not touching medianly. Genae, lora and clypeus brownish testaceous, each with a fuscous spot. Legs as in the male.

Length 2 (male) to 2½ (female) mill.

Hab. New South Wales, Mittagong (Jan.).

### *Phrynomorphus*.

This genus, in its most restricted sense, seems to be strictly synonymous with *Athysanus* Burmeister; the genus (for my purposes) has a transverse vertex, which is not longer than the pronotum, frons wide, wider at base than long, wide tempora and simple venation. The males have a valve. *P. taedius* is, I think, the only species of those I described in the first memoir that may be considered to belong here (*sens. strict.*)

In the subgenus *Conosanus*, with different head form, may perhaps be placed the following:

### 2. *longinquus.*

### 3. *hospes.*

Pl. I, figs. 13-17.

*Deltocephalus hospes* Kirkaldy 1904 Entom. 177

Originally described as an immigrant into Hawaii, it is now recorded from the whole of Eastern Australia (at least) and the lowlands of Fiji.

The *ova* are not remarkable, being of the usual Phrynomorphine type of Grass-feeder and are inserted in the usual way in the leaves of *Cynodon dactylon* (the "Dog's tooth grass" of England, and the "Maniania" of the Hawaiians).

The *last nymphal instar* (Pl. 1., f. 13) is of the form of the adult, pale testaceous, with 4 olive-brown longitudinal lines, the 2 lateral terminating anteriorly at the eyes. There are about 24 black bristly hairs, 3 on almost each segment, arranged in 3 longitudinal rows, one submedian, one sublateral and one lateral. The anterior margin of the vertex is narrowly white with faint fuscous marks and a very narrow anterior line of fuscous. Frons with fuscous transverse lines from a pale central line, on the basal third. Clypeus faintly fuscous; labium black-tipped, reaching to the fore trochanters. Femora brokenly banded with dark fuscous or blackish, tibiae and tarsi dark fuscous or blackish at base of some of the bristles (especially the larger ones). The 2 or 3 apical abdominal segments laterally fuscous. Eyes greenish. Antennal flagellum reaching to about the middle coxa.

The *other nymphal* instars do not differ appreciably except that the frons is pale.

### 4. *chlorippe,* sp. nov.

Very similar in appearance to *Deltocephalus abdominalis* (Fabr.).

Bright yellow, tegminal veins concolorous. Frons pale brownish, obscurely suffused with darker tint, and with slender, concentric, curved, dark fuscous lines. Genae, lora, clypeus, &c., pallid, the last named a little fuscate medianly. Metanotum, sterna, (mostly) and basal half of abdomen above and beneath (except the lateral margins) blackish. Basal half of fore and middle femora blackish, hind femora dorsally black (except apex), hind tibiae longitudinally lined with black. Vertex triangular, as long in front of the eyes as behind, wider than long, sulculate entirely, flat. Ocelli remote from the eyes. Frons longer than wide, with a small tubercle at the base medianly, a little wider apically than the clypeus basally; lora nearly touching the genae apcally; tempora narrow. Tegmina short, without appendix; not reaching apex of abdomen, apically rounded, only one subapical cell.

*Female*: last segment produced a little triangularly (very obtusely) in the middle; the pale brownish ovipositor is much longer than the elongate pygophor.

Length 3⅓ mill.

Hab. Queensland, Bundaberg (Sept.-Dec., Koebele).

*Vars*: the frons varies from piceous to pallid. This is a pretty little species and rare.

### *Thamnophryne*, gen. nov.

Differs from its allies by the minutely but deeply, completely, punctured pronotum; otherwise differs from *Thamnotettix* by the very short lateral margins of the pronotum.

#### 1. *nysias*, sp. nov.

Head pale brownish-testaceous; vertex irregularly suffused with fuscous; frons with a few concentric curved fuscous lines which are often much abbreviated towards the middle of the frons, often almost obsolete. Base of genae (around the antennae) dark fuscous. Pronotum dark fuscous, yellowish-brown laterally, comparatively thickly, but irregularly, punctured with yellowish-brown. Tegmina milky hyaline, veins dark fuscous, many of them more or less suffused, especially the crossveins at the apex of the subcostal cell, and the apical veins apically. Many of the cells with a more or less elongate fuscous spot in the middle, the brachial cell with two. Legs testaceous, hind tibiae with blackish spots at the base of the bristles. Sterna and abdomen below mostly dark fuscous. Vertex short, rounded, apically, forming a curve with the eyes which are rather wider than the maximum width of the vertex. Frons longer than wide, tempora very narrow, almost obsolete. Clypeus as wide basally as the frons apically, constricted a little just apical of the base, widening as much towards the apex.

*Male*: genital segments strongly tufted.

Length 4½ mill.

Hab. New South Wales: Mittagong (Jan.)

A male example from Queensland, Bundaberg, with the tegmina more suffused with olivaceous, and the genital segments not tufted, may form another species.

### *Lonatura.*

*Lonatura* Osborn & Ball 1898 P. Davenport Ac. Sci., VII 83.

#### 1. *austrina,* sp. nov.

Closely allied to *L. catalina* (which I presume to be the type), but the head is distinctly longer and the tegmina only reach to the base of the genital segment. Head, pronotum and scutellum pale yellowish, the frons with a pale ferruginous radiating pattern. Tegmina pale olive-green, the veins a little yellow, a broad smoky apical band. Abdomen black, the last segment white, pygophor white and black. Legs yellowish brown soiled with fuscous.

Length 1⅞ mill.

Hab. New South Wales, Sydney (Feb., K.); Queensland, Bundaberg (Sept.-Dec. P).

This tiny species is allied to *L. catalina* by the venation, but there is apparently no appendix; and to *L. megalopa* by the frons being longer and basally more angular and by being patterned, also the lora are remote from the apex of the clypeus.

### *Allygus.*

*Allygus* Fieber 1875 Rev. Mag. Zool. (3) III, 410.

#### 1. *lotophagorum,* sp. nov.

Yellowish-testaceous, marbled with olive-brown on pronotum. Vertex with a mark and 6 spots in olive brown. Ocelli orange-red, very conspicuous. Frons yellowish-testaceous, strongly and broadly marked with a black radiating pattern. Genae yellow, margined apically with black and a median black spot. Clypeus and lora black, the former with 2 short pale lines, the latter with a pale spot each. Tegmina milky hyaline, closely marbled with olive-brown, but in parts only, so that there are 3 milky spots along the commissure on the clavus, and 5 or 6 on the corium, the latter less distinct; nodal veins suffused. Legs black with pale bristles, apical half of fore femora black, the fore and middle tibiae spotted with the same, all the tarsi partly pale. Abdomen mostly black.

*Male*: genital pieces narrowly margined apically with whitish-testaceous and with white bristles.

*Female*: pygophor black, with white specks and white bristles on the apical half.

Length 3 mill.

Hab. Viti Levu, Rewa (Mch.-Apr., M), Ba (Jan., M.). A pretty little species.

### *Limotettix*.

On reconsideration, I think I have made a mistake in sinking this name. The whole affair is in a great muddle, hinging largely on the equally muddled *Cicadula*, of which the type is really, as ascertained in my former memoir, *smaragdula*. Sahlberg's *Limotettix* was heterogeneous; apart from one or two disputed species, variously assigned to *Phrynomorphus, Deltocephalus* &c., (all prior genera), it is comprised of two main sections, (1)=a section of the *Thamnotettix* of Puton's Catalogue (1899) and (2)=*Macrosteles* Fieber (=*Cicadula* Puton). As Woodworth has declared the type to be *quadrinotata* (Fabr.) i. e. of the species of the first section, and as Edwards (1896) also uses it in the same sense, it is perhaps proper to keep it so, with *Euleimonios* as a synonym.

### 2. *filicicola*, sp. nov.

Pale luteous, paler beneath, pronotum tinged with brown. Anterolateral margins of vertex broadly black (meeting angulately at apex). Pronotum with 4 dark fuscous lines, the two middle of which continue on to the scutellum. Tegmina with a nearly entire, dark fuscous, longitudinal median line, 2nd to 4th apical cells hyaline, veins dark, apical margin of the first suffused and a spot in the middle of the cell. Wings hyaline, veins fuscous. Abdomen above more or less fuscous.

*Male*: genital segments short, concolorous.

*Female*: last segment apically black, roundly emarginate; pygophors pale brownish ferruginous, elongate; ovipositor black, much longer than the pygophors.

Length (male) 3 (female) 3⅛ mill.

Hab. Viti Levu, (Nov. Muir's No. 15), Rewa (Apr. M.), on tree-ferns.

### 3. *tachyporias*, sp. nov.

Superficially somewhat like the last.

Pale yellowish, tergites and the underside paler. Frons basally and the lateral angles of pronotum blackish brown. Tegmina hyaline with an entire longitudinal, blackish brown median stripe. Vertex rounded (slightly angulate) extending in front of eyes, a trifle longer than wide at base.

*Male*: 7th segment subtruncate; valve narrow, semicircular; plates pointed, lateral margin sinuate, scarcely as long as pygophor.

*Female*: 7th segment very slightly produced in the middle.

Length 3⅞ (male) 4 (female) mill.

Hab. Queensland, Bundaberg. (Sept.-Dec. K.).

### 4. *capitatus*, sp. nov.

Head, pronotum and scutellum pale yellowish brown; vertex with 2 large metallic blue black spots; face tinged with ferruginous; a blackish spot on each side just apical of the antennal scrobes. Tegmina hyaline, faintly smoky, except the subcostal and the 3rd and 4th apical cells. Wings hyaline, veins pale fuscous. Legs pale yellowish brown. Underneath dark fuscous or blackish brown. External subapical cell longer than the interior.

*Female*: 7th segment roundly produced; pygophors fuscous with shortish yellow brown bristly hairs; ovipositor black.

Length 3 mill.

Hab. Queensland, Cairns, (Aug. P.).

## *Pettya*

### 1. *anemolua*.

The wingvein is like that of *Balclutha*, except that there is no submarginal vein.

## *Nesosteles*

The first two wings veins are confluent towards the apex. The genus is very close to *Balclutha*.

### 1. *hebe*.

Add: Viti Levu, Rewa (Mar., Apr., M.) and Navua (Feb. M), and I think the same species is at Bundaberg (Sept.-Dec.), Cairns (July) and Lucinda Point (July) in Queensland, but these species are difficult to separate.

### 2. *glauca.*

The vertex is shorter than in *N. hebe*, more convex and not flush with the pronotum. I think this also occurs at Kuranda.

### 6. *dryas* sp. nov.

Allied to *N. sordidior,* but smaller and paler. Head testaceous, more or less suffused with pale orange-brown, a short longitudinal suture and a lateral impression, reddish-brown. Pronotum creamy, with 3 thin orange-brown longitudinal lines continued (more widely) on to the scutellum. Tegmina creamy, veins white, the first two apical veins margined with fuscous. Wings milky hyaline, veins on the apical third mostly fuscous. Sterna, legs, and sternites creamy with a tinge of brown. Tergites black, last segment pale.

*Male*: Pygophor pale.

*Female*: last segment sinuately angularly emarginate, lateral angles acute; pygophor elognate.

Length 4½ mill.

Hab. Queensland, Redlynch (July), Cairns (July, Aug.). Bundaberg (Sept.-Dec.).

### 7. *aurantiigera,* sp. nov.

Head, pronotum and scutellum pale greenish-yellow. Tegmina and legs orange-red, the former with conspicuous whitish-veins, the apical cells hyaline. Wings milky. Tergites fuscous, hind-margin of the segments pale yellowish. Vertex rounded in front, less than half the length of the pronotum, about as long medianly as at the eyes.

Length 4 mill.

Hab. Queensland, Cairns (Aug., P.).

The two following species probably do not belong to *Nesosteles*, but as some of the species of that genus approach *Balclutha* (of which I know only one species), I prefer, for the present, to include these two in *Nesosteles*.

### 8. *phryne*, sp. nov.

Creamy testaceous, basal four-fifths of abdomen dark fuscous. Tegmina hyaline milky, veins creamy. Wings hyaline, veins on apical half pale fuscous. This differs from typical *Nesosteles* by the radial vein being scarcely obsolescent, and by the vertex being as long as wide between the eyes, nearly as long as the pronotum, angularly produced, nearly twice as long in the middle as at the eyes.

Length 4 mill.

Hab. New South Wales, Mittagong (Jan., K).

### 9. *chloe*, sp. nov.

Bright-green. Tegmina hyaline, veins green. Wings and wing-veins hyaline. Vertex roundly angulate anteriorly, a little shorter proportionately than in *N. phryne.*

Length 4 mill.

Hab. Queensland, Kuranda (Aug., P.) ; New South Wales, Sydney (Feb., K.).

## Euterygini.

Further study has necessitated the reduction of this group from subfamily to tribe. I am unable as yet to give a circumscribed diagnosis, owing to the inclusion of *Aneono* and *Dialecticopteryx*, but have not seen a specimen of any form where the basal part of the tegminal venation is clearly interpretable; apparently, however, the 3 main veins either spring together out of the basal cell, or the radial and median have a short stalk. (*) There seem to be four apical tegminal-cells, but often the first is obsolescent or even entirely absent. *Aneono* and *Dialecticopteryx* belong here by habitus, but have peculiar venation. The following table seems to bear a closer approximation to the natural affinities of the forms than that in my first memoir.

1 The 3 main veins of the tegmen running separately to the apical cells, or only joined quite close to the base...(2)
1a Median and cubital veins united by a stalk apically...(13)
2 Face of the usual type ............................(3)
2a Frons closed basally ...........................(12)
3 Three apical wing cells [Group A].................(4)

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* Woodworth's figure of an Eupterygine tegmen (1906, Techn. bull. Univ. California Ent. I f. 61, is unlike any I have seen.

3a Two apical wing cells [Group B] (**)..............(6)
3b One apical wing cell [Group C] (**)..............(11)
4 Tegminal appendix present..........................(5)
4a Tegminal appendix absent, submarginal wingvein present ............................................. (10)
5 Submarginal wingvein present.................1 *Alebra*
5a Submarginal wingvein absent...............2 *Protalebra*
6 Submarginal wing vein present; third apical wingvein forked .......................................... (7)
6a Submarginal wingvein absent.......................(9)
7 At least two of the apical cells of the tegmen arising from the transverse veins ...........................(8)
7a Only one of the apical cells arising directly from the transverse veins ..............................5 *Kahaono*
8 Body long and slender ....................3 *Dikraneura*
8a Body short and robust............'...........4 *Erythria*
9 First two wing veins subparallel..............6 *Eupteryx*
9a First two wing veins confluent towards the apex................................7 *Erythroneura* (=*Empoa*)
10 Vertex twice as long as pronotum..............8 *Nirvana*
10a Vertex shorter than pronotum ...............9 *Eualebra*
11 Submarginal wing vein present. 10 *Cicadula* (=*Empoasca*)
11a Submarginal wing vein absent..........11 *Typhlocybella*
12 Vertex wider than an eye, not produced anteriorly, forming a curve with the eyes; frons not twice as long as maximum width .......................12 *Apheliona* (type *Heliona biocula Melichar*)
12a Vertex narrower basally than an eye, angularly produced anteriorly; frons elognate, more than 3 times as long as maximum width; lora elongate.............13 *Heliona*
13 Vertex not produced in front of eyes; radial and median with a common apical stalk ........14 *Dialecticopteryx*
13a Vertex triangularly produced; cubital and median with a common apical stalk ......................15 *Aneono*

It appears to me that a form with three apical wing cells and a tegminal appendix represents the most generalized, degradation to two and then to one wing cell results in Groups B and C, the former first having a submarginal wing vein, then losing that.

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** Not counting the supernumerary cell.

*Alebra* seems to represent very fairly the more primitive forms and I imagine it more likely that *Protalebra* has been developed from a form like *Alebra* than *vice versa*. *Alebra*-like forms by losing the submarginal vein that is to say, the apical margins of the apical veins, develop into *Zygina*, *Eupteryx*, etc. I have no specimens now of *Nirvana* for examination, but judging from Melichar's figures, it is very likely to be an Eupterygine genus.

### *Cicadula.*

#### 2. *vitiensis.*

Line 9 of description, for "with" read "wing."

Hab. Viti Levu, Rewa (Feb. Mar. Nov. & Dec., M.).

One example is pale yellowish-green (instead of lemon-yellow) and the legs are green (instead of pale greenish); this, no doubt, is the colour when alive. The last segment of the female is practically truncate apically. The ocelli are fairly well pronounced and lie within the pale oblong, bordered by the two dark transverse lines, on the top of the head.

#### 3. *hyadas* sp. nov.

Pale lemon yellow, paler beneath. Eyes greyish-black. Tegmina milky, a short dark fuscous line on the apical margin at the basal internal angle and a greyish fuscous spot at the apex of the tegmen. Wings milky, veins partly fuscous. Vertex about as long as the scutellum, shorter than the pronotum, nearly twice as long medianly as at the eyes, angularly rounded in front.

*Female*: ovipositor black.

Length 3⅛ mill.

Hab. Viti Levu, Rewa (Dec., M.).

#### 4. *euryphaessa* sp. nov.

Allied to *C. rufa* (Melichar), but the head is longer, pronotum shorter, legs pale, etc. Bright scarlet; vertex pale testaceous with a mediolongitudinal suffused scarlet stripe, which forks at the base of the frons and extends all over the face suffusedly (sometimes the red stripe is obsolete at the fork, the frons then being entirely pale, only the genae and the clypeus, etc., red.) Apical third of tegmina hyaline, iridescent, veins there pale yellowish. Wings hyaline, iridescent, basal veins pale sanguineous.

Tergites mostly sanguineous. Underside and legs pale testaceous, the former sometimes a little suffusedly sanguineous. Vertex longitudinally sulculate, anteriorly somewhat swollen, longer than wide, roundly produced before the eyes. Pronotum scarcely wider than the head and only about one-half of its length, shorter than the scutellum, scarcely emarginate posteriorly, lateral margins short. Tegminal venation that of *C. rufa,* except that the interior branch of the first apical vein is curved.

*Female*: last sternite very slightly sinuate, the pale part longer than wide.

Length 2½ mill.

Hab. Viti Levu, Rewa (Mar.-Apr.) Navua (Feb. Muir's No. 53) on a native tree, also on *Saccharum officinarum.*

There is a purplish bloom on one example, giving it a superficial resemblance to *Erythroneura doris.*

## *Erythroneura.*

### 6. *sidnica,* sp. nov.

Pale yellowish, immaculate, paler beneath. Head shaped as in *E. dentata* (Gillette), but more rounded and the eyes more decumbent on the pronotum, which is posteriorly slightly emarginate.

Length abt. 3 mill.

Hab. New South Wales, Sydney (Jan.-Feb., K.).

In bad condition.

### 7. *doris* sp. nov.

Distinguished by the large pronotum and minute scutellum, as well as by the colour.

Head, pronotum, sterna, legs, etc., pale testaceous. Pronotum laterally from antero-lateral angle of the scutellum to the interoposterior angle of the eye, dark fuscous. Scutellum testaceous tinged with pale purplish blue. Tegmina pale sanguineous, tinged with violaceous, basal two-thirds of subcostal and subradial cells purplish, apical third of tegmina hyaline, veins pale sanguineous. Wings hyaline, iridescent, tinged with fuscous, veins dark. Abdomen dark fuscous. Vertex wider than long, extending nearly as far in front of the smallish eyes as basally, angularly rounded apically. Pronotum large, a little wider than the head, and longer than the vertex, about one-half wider than long, lateral margins long, anterior and posterior margins subparallel. Scutellum minute, not one-half the length of the pronotum.

Length (female) 2¼ mill.

Hab. Viti Levu, Rewa (Apr., Muir).

### 8. *lalage*, sp. nov.

Allied to the last, but head shaped differently, scutellum longer and different colour. Head, sterna and legs pale testaceous, the vertex with a large dark fuscous spot arising close to the base and extending on to the frons nearly as far apically as in line with the insertion of the antennae. Pronotum anteriorly obscure purple, posteriorly dark fuscous, an obscure fuscotestaceous line mediolongitudinally, extending on to the obscure-purplish scutellum. Abdomen dark fuscous. Tegmina and wings as in *E. doris*. Eyes a little larger; vertex more rounded on the anterolateral margins, wider than long. Pronotum as in *doris*, but a little shorter and the anterior margin a little arched. Scutellum at least three fourths of the length of the pronotum.

*Female*: base of genital segment obscurely pale.

Length 2¼ mill.

Hab. Viti Levu, Rewa (Apr., Muir, 1 female).

### 9. *leucothoe*, sp. nov.

May be regarded as a "*Zygina*," although there are three subparallel apical veins, the first diverging a little outwards, and being a direct continuation of the radial, more approaching *Dikraneura* from which it differs only by the absence of the submarginal. Pale whitish testaceous; tegmina milky white, (a large opaque area occupying middle third of subcostal cell), veins concolorous; a blood-red spot at the base of the second apical vein and a tiny blood-red speck at the apex of the clavus. Vertex produced well in front of the eyes, about as long as wide, roundly angulate. Pronotum anteriorly rounded, about as long as the vertex and a trifle longer than the scutellum. Eyes not nearly touching base of tegmina. Radial and median veins apparently unite at about the apical margin of the basal third of the tegmen.

Length (female) 2 mill.

Hab. Viti Levu, Navua (Feb., Muir).

### 10. *rewana*, sp. nov.

Yellowish-brown, paler beneath, pronotum somewhat sordid, abdomen blackish. Tegmina smoky hyaline; clavus, sutural cell of corium and subcostal cell, pale yellow smoky in parts; veins pale yellow; a dark smoky spot at apex of tegmen. Wings smoky hyaline, veins smoky. Vertex somewhat convex, roundly prominent in front of eyes, but not so long as wide. Four apical cells to the tegmen, the first very small.

Length 2⅓-2½ mill.

Hab. Viti Levu, Rewa (Mar. & Dec. M.).

The yellow is apt to fade and become obscure.

*Nymph*: The ultimate stage (as far as can be judged from the empty skin) is brownish-yellow. Head produced in front of eyes at least as far as the length of the rather long eyes beyond them. Antennal peduncle elognate and conspicuous, flagellum much longer than the body. There are a large number of erect capitate hairs disposed as follows: 6 on the lateral and anterior margin of the vertex 4 on the pronotum, 8 submedian and 6 lateral on the abdominal tergites, also a number on the meso and metanotum, tegminal pads and legs.

### *Dialecticopteryx*, gen. nov.

An aberrant genus, distinguished by the peculiar venation of tegmina and wings.

Vertex transverse, declivous, anteriorly rounded, not (or scarcely) prominent in front of eyes, longitudinally sulculate, posteriorly marginate and raised from the pronotum. Pronotum transverse, little longer than the vertex, lateral margins short, carinate. Scutellum longer than wide, about as long as the pronotum. Tegmina (Pl. 1, fig. 7) sparsely punctured, venation obscure; the radial and median are united at the base, fork soon after, but keep very close together till a little basal of the apical calls when they reunite; cubital obsolete basally, only appearing a little basal of the apical cells. The radiomedial reforks apical of the subapical line, thus forming a triangular cell; there are 2 quadrilinear cells interior of this (perhaps more if the apical veins fork). No veins in the clavus and no appendix. The extreme apex of the wing is unfortunately broken but enough remains to show its peculiar character (see Pl. 1 fig. 6). This genus shows some relationship to *Nesosteles*, etc.

### 1. *australica*, sp. nov.

Pl. 1. figs. 6-7.

Orange-yellow, legs paler; 2 large bluish-black round spots on the vertex and a smaller one on the frons. Pronotum with an inverted blue-black V, connecting on the scutellum with an inverted A. Tegmina milky white, subcostal vein basally, radial, median and commissure suffusedly smoky, extreme margins of tegmen here narrowly black; radiomedial (apical) and continuation of the commissure apical of the clavus, smoky but not suffused. Wings hyaline, iridescent, veins pale fuscous partly.

*Male*: plates long, triangular taken together.

*Female*: 7th sternite triangularly produced, pygophor yellowish brown, ovipositor dark fuscous.

Length 4½ mill.

Hab. Queensland, Bundaberg (Sept.-Dec., K.).

## Tribe *Cephalelini*.

This is only a small part of the tribe of this name in my first memoir. It is restricted to those forms in which the tibiae are very feebly bristly; owing to a degradation of the flight organs, the tegminal and wing venations are usually much reduced. Incidentally the head is usually greatly elongate and foliaceous or subfoliaceous.

*Cephalelus, Dorycephalus, Paradorydium*, and others not known to me in nature, as *Dorydiella*, belong to this tribe.

## *Parodorydium.*

### 4. *brighami*, sp. nov.

Distinguished from the other species by the short vertex.

Pale yellowish, closely punctured with light brownish, the punctures being closer and darker on the basal half of the pronotum. Head close around insertion of antennae, the labium, sterna, etc., dark fuscous. Sternites (except the last segment which with the genital segments is pallid) infuscate. Fore femora ringed with fuscous. Vertex acute anteriorly, lateral margins straight. Frons anterior to the antennae diamond-shaped, then the lateral margins parallel, the insertion of the antennae about on a line with the apical margin of the eyes (instead of distinctly nearer the anterior angle of the head); apical margin of clypeus minutely notched, extending apically distinctly beyond the apical margin of the genae.

*Male*: vertex nearly twice as long as pronotum; maximum width greater than median length.

*Female*: vertex about twice and a half as long as the pronotum; maximum width less than median length.

Length 3½ mill.

Hab. New South Wales, Mittagong (Jan., K.).

This species, (which I name in honour of Dr. W. T. Brigham, Director of the Bernice Pauahi Bishop Museum in Honolulu, whose "Index to the Islands of the Pacific" (1900 Mem. Bishop Mus. I, 1-172) is of such great value to the student of Pacific Faunas), seems very distinct from such *Paradorydia* as *lanceolatum*, *foveolatum*, etc., but I can see no generic differences beyond the much shorter head. On this and the straight lateral margins of the vertex, I found a new subgenus *Deltodorydium*.

### 5. *ovidii* sp. nov.

Allied to the last, but the head more elongate, the head and pronotum forming two-fifths of the entire length, and the lateral margins are concavely curved, the species thus falling into the typical subgenus. It differs from *P. foveolatum* Sign., by the much less spatulate head and less pointed tegmina.

Length (female) 5 mill.

Hab. New South Wales, Mittagong (Jan.).

## *Dorycephalus.*

### 3. *trilineatus.*

The exact habitat was "New South Wales, Sydney (Jan., K.)."

## Tribe *Iassini.*

Van Duzee includes this as a tribe of his Jassina, but it is far more distinct from his 'Deltocephalini' than these are from his 'Subfamily Acocephalina.' The Iassinae are characterized by the vertex being perpendicularly raised at the sides and base, the latter being practically truncate between the eyes, and distinctly narrower there than the apical margin of the scutellum. Head and eyes distinctly narrower than the pronotum. Frons elongate. Wings with a supernumerary cell. There is only one subapical cell in the tegmen (*). The ocelli are well-marked and are on, or near, the apical margin of the vertex and are visible dorsally. In the 3 genera known to me, the vertex is obliquely striate, the pronotum finely granulate and the scutellum very finely punctured. The female genital segments are of the usual Tetigoniine type, but the male plates are very long and of characteristic appearance; the valve is wanting.

The structure of the head, of the venation and of the male plates distinguish this group very thoroughly. *Macroceratogonia* has some affinity with these forms, but only females are known at present; the interior discoidal cell is also divided by a transverse vein in both the specimens I have seen. It has also great affinity with the Tetigoniini and Penthimiini, but must at present be relegated to a provisional tribe by itself.

Eight genera of Iassini are known.

1 Vertex more than twice as long as wide, triangular produced ........................................3 *Muirella*
1a Vertex not longer than wide........................(2)
2 Fore femora and tibiae foliaceous.......................................8 *Gabrita* (=*Petalopoda*)[**]
2a Femora simple ....................................(3)
3 Pronotum keeled ..............................7 *Thagria*
3a Pronotum not keeled ..............................(4)
4 Vertex expanded posteriorly behind the eyes; ocelli near the apical margin of the vertex; anterior and posterior margins of the pronotum subparallel.........5 *Tinobregmus*
4a Vertex not expanded behind the eyes..................(5)
5 Occelli near the eyes; anterior margin of pronotum rounded ..........................................(6)
5a Ocelli remote from the eyes; anterior margin of pronotum straight ..............................6 *Neococlidia*
6 Scutellum much shorter than pronotum..........4 *Palicus*
6a Scutellum not shorter than pronotum.................(7)
7 Anterior tibiae curved ........................3 *Terulia*
7a Anterior tibiae straight ...........................(8)
8 Frons rather flat, distinctly sutured; tempora wide but short; antennae inserted near the intero-posterior angles of the eyes ....................................1 *Iassus*

[*] It is true there are two in *Tharra labena*, but in the unique type of this, the exterior discoidal cell is divided apical of its middle by a short transverse vein, which is absent in the other species of the genus.

[**] There is nothing in the descriptions of these to keep them apart.

8a Frons raised, less distinctly sutured, tempora narrow and very short, antennae inserted near the intero-anterior angles of the eyes ............................2 *Tharra*

## *Tharra.*

I separated this (Bull. I p. 324) from *Iassus* by the possession of two subapical cells and the absence of transverse veins in the clavus; the latter is of no value and the former is, I am inclined to believe, accidental. It is possibly only a group of *Iassus*, but for the present may be separated by the characters given in the key. Typical *Iassus* also seems to have the apical margin of the vertex forming more or less of a curve with the eyes. The only species of *Iassus* I have seen is represented by a pair of *I. olitorius* Say, kindly given me by my friend, Mr. Van Duzee.

In *Tharra labena, kassiphone,* etc., the median and brachial veins are generally united by a straight cross vein at their bases, this being united to the radial by an outwardly inclined oblique vein; but in *T. kalypso* and *ogygia* there is usually a common longitudinal stalk for the median and brachial, which is united to the radial by the oblique vein. This however is not constant and moreover sometimes the stalk vanishes, and the median and brachial unite at an angle.

In all the species, the frons is not, or only faintly, medianly keeled and the clypeus is not ampliate, though often a little widened, apically.

The species (all Australian and Fijian up to the present) may be disposed as follows:

1 Vertex distinctly narrower at the base than at the anterior margin of the eyes, not flush with the eyes, lateral margins gradually divergent. Anterior and middle legs bright orange yellow.......................... 5 *kassiphone*

1a Vertex little wider (if at all) at anterior margin of eyes than basally, flush with the eyes, lateral margins parallel or subparallel as far as the anterior margins of the latter. Legs pallid or black ................................2

2 Part of vertex produced before eyes not more than a third of the length of the basal part ......................3

2a Part of vertex produced before eyes about two-thirds of the length of the basal part ....................4 *nausikaa*

3 Tegminal veins bright sanguineous ..............1 *labena*

3a Tegminal veins pallid, sometimes faintly sanguineous....4
4 Tegmina yellowish brown; head and pronotum more or less orange brown ..............................2 *ogygia*
4a Tegmina pale testaceous, a pale fuscous band across the middle ....................................3 *kalypso*

*Iassus detractus* Walker, from Tasmania, is not included.

### 1. *labena*.

I have little doubt that the division of the discoidal, in the unique specimen, is an aberration. This single example is a male, not a female. The last segment is deeply, minutely, roundly emarginate and the plates (not 'valve') are elongate, and covered with long, curling, rather coarse, white hairs.

### 2. *kalypso* sp. nov.

Pale yellowish testaceous, a little paler beneath, vertex slightly embrowned. Tegmina hyaline with colourless veins (sometimes very narrowly margined with pale greyish fuscous), an irregular pale greyish fuscous band across the tegmen, sometimes other small suffusions. Tibiae apically and tarsi fuscous. Tergites more or less fuscous discally. Vertex much as in the type, perhaps a trifle wider; frons also in the type, but a little flatter, clypeus scarcely so broad apically.

*Female*: last segment roundly, a little angularly, produced, angularly emarginate narrowly, but sufficiently deeply, posteriorly; medianly carinate; the fuscous ovipositor is longer than the pygophor.

Length 6¼-6½ mill.

Hab. Viti Levu, Rewa (Apr., Muir).

### 3. *ogygia* sp. nov.

Form of the last; cheeks a little marginate interiorly. Yellowish brown, paler beneath, more or less suffused with rosy on head and pronotum. Tegmina yellowish brown, veins concolorous, or slightly tinged with sanguineous, apical cells apically (sometimes medianly but obscurely) fuscous. Apical half of hind tibiae dorsally fuscous. Tergites more or less fuscous discally.

*Male* plates elongate, with short pale yellowish grey bristly hairs.

*Female* genital segments much as in the last.

Length (male) ½ (female) 6 mill.

Hab. Viti Levu, Rewa (Mar.-Apr., Muir).

### 4. *kassiphone* sp. nov.

*Male*: shining black; lateral margins of vertex, very narrowly (and ending at the apical margin of vertex), antennal peduncle, and labium, pale yellowish. Tegmina very dark fuscous, basally opaque black, shining. Fore and middle legs (except the somewhat fuscous coxae and claws) bright orange yellow; hind tibiae pale at extreme apex. Appendix to tegmina pale. Wings dark fuscous, veins black. Vertex distinctly narrower at the base than between the apical margins of the eyes, not flush with the eyes at the former, diverging regularly towards their apical margin, scarcely one third extended in front of the latter. Antennae inserted at about the middle of the interior margin of the eyes (ventrally), tempora short, very narrow. Plates much as in *T. labena*, but the hairs shorter and yellower.

*Var.* Clypeus, and apical margin, very narrowly, of genae, pale.

*Female.* Larger than the male; a longitudinal elongate-oval, pale yellow line on the vertex, not attaining (as a rule) the apical margin or the base; genae (except a trifle fuscous here and there sparsely) and clypeus pale yellow, as also sometimes the extreme base of the lorae. Tegmina with the subcostal vein right around to the apex of the tegmina, a long oval spot near the base of the subcostal cell and a long suboval stripe exteroapically on the same, a small spot near the apex of clypeus and another at the base of the tegminal appendix, pale yellowish brown. Fore and middle femora, tibiae and tarsi etc., bright orange-yellow, hind legs mostly blackish, at least dorsally Genital segment as in *T. kalypso*, but scarcely emarginate medianly.

*Var.* Sides of pronotum pale yellowish, narrowly.

Length (male) 5 (female) 6 mill.

Hab. Viti Levu, Rewa (Mar., Apr., Dec., Muir).

### 5. *nausikaa* sp. nov.

Similar to the last, but less polished, fore and middle legs *pale* yellowish, the yellow of the head and pronotum browner, the head longer, etc.

*Male*: black, with a strong, entire, wide, longitudinal pale yellowish-brown, continued to the posterior angle of the scutellum, the pale lateral margins of the head widening a little in front of the eyes and meeting in a curve at the base of the frons;

apical half of clypeus, the labium, fore and middle legs (except the more or less fuscous coxae and claws) pale; hind femora dark, tibiae more or less pale, at least ventrally. Tegmina dark fuscous, subcostal cells up to the oblique vein (except extreme base), a spot close to apex of subcostal cell, apical of the oblique vein, a spot at base of appendix, etc., pale. Vertex very little wider at anterior margin of eyes than at base, the latter practically flush with the eyes, lateral margins subparallel as far as anterior margins of eyes, then suddenly diverging. Vertex anteriorly roundly angulate, nearly as long in front of eyes as behind their anterior margin; frons rather narrower apically.

*Vars.* face entirely blackish or mostly pale; there are sometimes 3 pale lines on the pronotum. Tegminal veins varying from black to pale yellowish-brown, the latter sometimes a little tinged with sanguineous. Tegmina varyingly spotted with pale yellowish brown. Scutellum sometimes immaculate, sometimes posterior third pale.

*Female* larger than the male, and usually of the paler vars.

Extreme var. (male and female). *pallidor* nov. is pale cinereous above, with only scattered fuscous spots on the tegmina, four fuscous lines on the pronotum, etc.

Length (male) 4½-(female) 5½ mill.

Hab. Viti Levu, Rewa, (Feb., Apr., Nov., Muir), Navua. (Feb., Sept., Muir); Muir's No. 201 is an example of the less typical forms.

### 6. ————, sp?

Pl. II, fig. 14-15.

Only the nymph known so far.

Yellowish-white. Apical half of vertex; all the face except a median longitudinal stripe in the middle, reaching the clypeus but not the vertex; pronotum, tegminal pad, apical margin laterally of metanotum; two stripes down the abdomen, not quite reaching posterior margin, joined basally and apically, extending at these points to the lateral margins; apical half (except extreme) of femora, basal third (except extreme) of hind tibiae; sanguineous. Claws and arolia fuscous.

Hab. Viti Levu, Rewa (Apr., M.).

## *Muirella* gen. nov.

Vertex flat, elongate, a little declivous, and somewhat sloping laterally, about twice and one half as long as wide at the truncate base, lateral margins parallel for about three-fourths of their length, then diverging outwardly to a little beyond the anterior margin of the eyes, then converging strongly, forming a roundedly acute angle. In profile the head is subconical. Ocelli lateral, a trifle nearer to the eyes than to the top of the head, visible dorsally. Frons elongate, about twice and a half as long as wide at antennal scrobes, a little wider just basal of this, narrowing apically and basally, basally acutely triangular, apically subtruncate. Tempora very short and narrow. Genae deeply impressed roundly in the middle. Clypeus not produced beyond the apical margin of the genae, about twice as long as wide, strongly carinate on the basal half, a little wider than the lora which do not touch the posterior margin of the genae. Labium reaching to anterior margin of fore trochanters. Antennae inserted anterior to the middle of the eyes (viewed in profile), the eyes extending posteriorly beyond the apical margin of the frons (thus separating this genus from the others) and decumbent nearly one-half, on the pronotum dorsally; seta long, more than half the length of the body. Pronotum transverse, lateral margins fairly long, somewhat feebly carinate; posterior margin obtuse-angularly emarginate. Scutellum wider than long. Tegmina with one subapical and 4 apical cells; the subcostal cell obliquely divided near the apex by a fork of the radia[1]. Wing with a supernumerary cell, which however does not nearly reach the apical margin of the wing, the next of the apical cells being thus short and broad.

### 1. *oxyomma* sp. nov.

Pl. II, fig. 21-2.

*Male*. whitish testaceous (sometimes pale yellowish brown), usually more or less suffused rosily. Face usually with a transverse blackish band from eye to eye near the base (lora and clypeus, etc., often more or less fuscous). Prosterna, pleura partly, a spot on fore coxae, etc., blackish. Abdomen mostly blackish. Tegmina with the clavus, basal half of corium (except subcostal cell) and a bifid band near the apex dark fuscous or blackish (opaque basally), the rest yellowish brown. Veins bright sanguineous. Wings dark fuscous, iridescent, veins black. Hind femora more or less blackish. Plates long, with long pale greyish hairs.

*Female*: abdomen yellowish testaceous, partly suffused with fuscous. Tegmina yellowish brown, an oblique dark fuscous band at base of apical third, a more obscure one basal of that; apical margin narrowly smoky, veins bright sanguineous. Hind femora pale. 7th sternite sinuate, minutely obtuse-angled in the middle.

Length (male) 6- (female) 6¼ mill.

Hab. Viti Levu, Rewa (Mar., the unique male, type, and females) and Navua (Feb.) (Muir's Nos. 116 and 203).

*Nymph*: pale whitish testaceous, fuscate on pronotum and scutellum, sparsely so on tergites; some sparse orange-red marks on the head. Vertex, pronotum and scutellum carinate, the first much of the appearance it has in the adult. Tergites with one submedian and one lateral row of piliferous, punctured granules. (Pl. I. figs. 10-12).

I have pleasure in dedicating this genus and species to my friend and colleague.

## Tribe Penthimiini.

(=Gyponidae auctt.)

I can find no good characters to separate this tribe. It runs into the Tetigoniini via *Evacanthus*, into the Phrynomorphini via *Errhomenellus* and *Chiasmus*; its forms are usually less elongate, and the ocelli are usually on the disk of the vertex, but situated in front of a line drawn between the anterior margin of the eyes: this is however not the case in some species at present attributed to *Gypona*.

The following genera are I believe all that have been described:

1 The head dorsally with a large suboval area separated off anteriorly by a deeply impressed line. . 1 *Ectopiocephalus*
1a Head dorsally without a part separated off. . . . . . . . . . . (2)
2 Tegmina very short, venation obscure. . . . . . . . . . . . . . (3)
2a Tegmina reaching at least as far as the base of the genital segment, fully formed . . . . . . . . . . . . . . . . . . . . . . . . (4)
3 Clypeus extending well beyond the apical margin of the genae, longer than half the length of the frons. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 2 *Errhomenellus*
3a Clypeus extending only as far as the apical margin of the genae, not longer than half the frons . . . . . . 3 *Chiasmus*

4 Pronotum prolonged posteriorly (more or less as in the Cercopidae) or at least distinctively longer than wide (5)
4a Pronotum wider than long........................(7)
5 Pronotum medianly truncate behind......... 4 *Signoretia*
5a Pronotum angularly emarginate behind..............(6)
6 Vertex gently rounded in front; frons subquadrate, truncate basally ......................... 5 *Bathysmatophorus*
6a Vertex subangular in front; frons longoval, produced basally ................................. 6 *Xerophloea*
7 Frons with a keel down the middle........7 *Evacanthus*
7a Frons without a longitudinal keel..................(8)
8 Tegmen without an appendix ....................(9)
8a Tegmen with an appendix ........................(10)
9 Ocelli indistinct ............................8 *Aglena*
9a Ocelli distinct ...............................9 *Uzelina*
10 Tegmina apically subsinuately truncate..........10 *Jafar*
10a Tegmina apically more or less rotundate............(11)
11 Pronotum extending farther laterally than the tegmina, which arch outwards beyond the subaparllel basal fifth ................................... 11 *Penthimia*
11a Pronotum not extending farther laterally than the tegmina, which arch outwards from the base, if at all........(12)
12 Scutellum distinctly wider than the head..12 *Penthimidia*
12a Scutellum not wider than the head.................(13)
13 Anterior margin of vertex in profile acute or subacute; frons basally excavated .......................(14)
13a Vertex not acute in profile, sometimes bluntly keeled; frons not excavated ..................................(15)
14 Head laminate; tegmina hyaline ......13 *Thaumatoscopus*
14a Head scarcely foliaceous; declivous; tegmina with numerous ramose "false" veins................14 *Vulturnus*
15 Vertex declivous, sufficiently elongate........15 *Gypona*
15a Vertex very short, forming one curve with the frons..(16)
16 Pronotum transversely striate.................16 *Scaris*
16a Pronotum not striate ........................17 *Zinneca*

18. *Neodartus,* I do not know.

*Vulturnus.*

Differs from *Thaumatoscopus* principally as follows: vertex more declivous; clavus and the subcostal cells with numerous transverse veins and usually the entire tegmen with numerous incomplete veins. There seem to be 8 good species in the Koebele-Perkins material, separable as follows:

1 Margin of head between vertex and frons, acute; anterior part of head laminate ..........................(2)
1a Head anteriorly sublaminate, anterior margin thickened (4)
2 Length over 5¼ mill.......................3 *virgidemia*
2a Length under 5 mill..............................(3)
3 Vertex a little longer than pronotum..........1 *vulturnus*
3a Vertex not longer than pronotum .............2 *voltumna*
4 Vertex ivory white, very sparingly speckled with palebrown ..................................... 4 *vanduzeei*
4a Vertex ivory white, with a basal fascia of pale brown specks ............................................ (5)
4b Vertex dark, very closely speckled with pale yellowish..(6)
5 Larger, broader ..............................5 *vaccors*
5a Smaller, more parallelsided ..................6 *vultuosus*
6 Broader and paler ............................8 *vappa*
6a Narrower and darker ......................7 *vaedulcis*

Div. 1. Margin of head between vertex and frons acute, foliaceous.

### 1. *vulturnus.*

Head, pronotum and scutellum yellowish-brown, pronotum more or less infuscate. Eyes dark, ocelli reddish. Foliaceous part of frons and 2 spots on genae on each side, orange-red, rest of face and the prosternum black (or the frons may be entirely orange-red or entirely black except a narrow basal line). Underside testaceous. Tegmina sordid whitish, mottled with greenish brown or pale greenish or bluish-black, veins brownish yellow.

Vertex longer than pronotum, wider between the eyes than long, distinctly reflexed anteriorly, lateral margins of vertex in front of eyes short but very distinctly curved outwards before joining the arched anterior margin. Hind legs usually more or less dark.

*Male*: last segment truncate, a little shorter than the short pygophors.

*Female*: last segment slightly sinuate, a little produced medianly and laterally; pygophors about 2½ times as long as last segment, slightly shorter than ovipositor.

Length (male) 4-4¼ mill; (female) 4½-4¾ mill.

Hab. Queensland, Cairns (Aug., P.); Kuranda (Aug., P.).

### 2. *voltumna* sp. nov.

Closely allied to *V. vulturnus*, but vertex a little shorter, not longer than pronotum, strongly impressed transversely in the middle, basal part declivous, apical part slightly recurved, almost porrect instead of declivous as in *V. vulturnus*.

Vertex strongly, pronotum sparingly, mottled with blackish brown; scutellum marked with same colour. Tegmina heavily smudged with black. Underside black except the non-foliaceous part of frons and the basal margin (narrowly) of the foliaceous part, sordid orange. Anterior legs and bristles on the others, yellowish testaceous.

*Female.* Genital segment much as in *V. vulturnus.*

Length 4⅓ mill.

Hab. Queensland, Kuranda, (Aug., P.).

### 3. *virgidemia* sp. nov.

Vertex, frons, clypeus, pronotum and scutellum castaneous, more or less clouded with blackish. Genae, lora, sterna, &c., more or less black. Tegmina yellowish testaceous, apically a little hyaline and more dilute, veins blackish brown, the colouring being more or less blotchy; the clavus subirrorate; the cells are mostly more or less marked with blackish-brown. Wings smoky, veins black. Fore legs pale, other legs more or less fulvous, longitudinally striped with black. Sternites yellowish brown, marked with darker brown.

Vertex about, or a little more than, twice as wide as long, rounded anteriorly parallel to posterior margin, extended laterally in front of the eyes about as far as posteriorly.

*Female*: last segment produced a little medianly, pygophors longer than ovipositor.

Length 5⅓ mill.

Hab. Queensland, Kuranda (Aug., P.).

Div. 2. Margin of head blunt, subfoliaceous.

### 4. *vanduzeei* sp. nov.

Allied to *V. vulturnus*, but the margin of the head is not acute anteriorly, and the anterior margin immediately in front of the eyes is not (or not noticeably) divergent, before curving upwards and inwards.

Vertex, pronotum, and scutellum ivory white, more or less tinged with greenish, the vertex with a few scattered brownish specks; pronotum obscurely mottled with greenish brown, sometimes with a whitening medio-transversely. Face black except for a few redbrown marks and the ivory-white basal margin. Sterna and pleura black (except for the more or less pale exterior half of propleura). Tegmina ivory white tinged with green, veins and in complete veins brownish. Fore legs pale, others mostly blackish; bristles pale. Sternites and genital segment pale or dark varyingly.

*Male*: pygophors a little more than twice as long as last segment which is bisinuate.

Length 4-4½ mill.

Hab. New South Wales, Sydney (Jan., K.).

The nymphs are not specially remarkable.

### 5. *vaecors* sp. nov.

Allied to the last, but the basal margin (except extreme part) with a transverse band of minute brownish reticulations. Pronotum mottled with palebrown, with a well defined undulating ivorywhite median fascia.

*Male*: genitalia much like those of the preceding species.

Length 4¼ mill.

Hab. Queensland, Bundaberg (Sept., Dec., K.).

### 6. *vultuosus*, sp. nov.

Very close to *V. vaccors*, but smaller, narrower and darker. Vertex a little shorter. Pronotum with a well marked white fascia and some black marks as well as the pale brown mottlings.

*Female*: last segment with 2 tiny median notches.

Length 3¾-4 mill.

Hab. Queensland, Cairns (Aug., P.); Nelson (July, P.); Kuranda (Aug., P.).

### 7. *vacdulcis* sp. nov.

Black; vertex, pronotum and scutellum thickly speckled with pale yellowish brown. Frons margined basally with yellowish. Tegmina pale yellowish brown heavily veined and marked with black; apex of costal cell and of the adjoining subapical white, spotshaped. Fore legs and bristles, &c., of the others, more or less pale. Vertex not longer than pronotum, rounded in front.

Length 3-3¼ mill.

Hab. Queensland; Cairns (Aug., P.); Bundaberg (Sept.-Dec.); New South Wales, Sydney (Jan.-Feb., K.).

*Nymph*: Vertex laterally spinose just above the eyes.

### 8. *vappa* sp. nov.

Very close to *V. vaedulcis*, but paler and broader. Tegmina with a large colourless patch on the costa, &c.; apical parts largely colourless.

Length 4 mill.

Hab. New South Wales, Sydney (Jan.-Feb., K.).

## Tribe Tetigoniini.

In the Tetigoniini, the male genital segments are of simple form. The last abdominal is probably the seventh. The pygophor is sometimes not visible ventrally, being covered over by the "Plates", which are not visible dorsally, except between and below the pygophor; apical of the 7th segment, there is dorsally a small semicircular plate, and ventrally a small triangular plate, which is called the "Valve"; both these may be altogether absent and their absence or presence is probably of generic value; for example, taking the careful figures in Ball's Monograph of the North American Tetigoniini, I find that the *valve* is present in *Draeculacephala* and *Helochara*, absent in *Diedrocephala, Tetigonia, Homalodisca, Aulacizes*, and *Oncometopia*. I am not sure that the *Plates* may not be absent sometimes.

In the females, the 7th segment is the last abdominal, the 8th is absent ventrally and only lateral margins can be seen, basally at the sides, the 9th is divided and is generally shorter than the ovipositor; the 7th is usually narrower than the preceding tergites and is very mobile, being lifted up from the apex, at right angles, so that the ovipositor can have free play.

### *Tetigonia.*

There is no male valve in this genus (or if so, it is concealed).

### 1. *albida.*

Add Viti Levu, Rewa (Apr., Muir).

### 2. *koebelei.*

The 7th segment (female) triangularly (sides somewhat rounded) produced, the 8th segment attaining laterally about half the length of the pygophor, which has sparse dark hairs along by the ovipositor and at the apex, and very slightly exceeds the ovipositor in length.

### 5 and 9. *albomarginata.*

*Tettigonia albomarginata* Signoret 1853 A. S. E. France (3) I, 347, Pl. X, f. 4.

*Tettigonia pettimolua* Kirkaldy 1906 Bull. Ent. H. S. P. A., I, 321.

At the time of writing my description, Signoret's 'Revue' was unpurchasable, and I did not imagine that this species would be described as '*albomarginata*;' I have since been able to acquire, for the Station, Signoret's work and to identify Signoret's species. The colour of the tegmina, as indeed Signoret figures them, is dark metallic green, not plumbeous-black, as he writes. The species was found by Koebele on *Saccharum officinarum.*

### 7. *coerulescens.*

For Signoret's reference, read: *coerulescens* Sign., 1853 A. S. E. France, (3), I, 672, Pl. XXI, f. 16.

The vertex is subangulate, and the species is probably not a true *Tettigonia.* It is not coerulescent.

The genera of this tribe may be temporarily disposed as follows:

1 Juga porrect, straight or slightly deflexed at the apex, distinctly interrupting the lateral curve of the vertex; fore tibiae distinctly sulcate or flat, sometimes dilated......(2)

1a Juga suddenly deflexed or noticeably curved from the base, never interrupting the lateral curve of the vertex; fore tibiae subcylindric (rarely otherwise)............(26)

2 Pronotum distinctly sexangular (or more), lateral angles distinct; tegmina completely covering the sides of the abdomen ..........................................(3)

2a Pronotum transverse, quadrangular; rarely feebly hexangular (in which case the lateral angels are rotundate); tegmina often exposing the sides of the abdomen......(8)

3 Pronotum normal; head not shorter than the pronotum.(4)

Pronotum crested or tuberculate or carinate. Head shorter than the pronotum..............................(6)

Vertex sulcate longitudinally without an articulated appendix; fore tibiae a little dilated........................(5)

Vertex not sulcate, longitudinally, but with an articulated, elongate apical appendix; fore tibiae not dilated.....................................................1 *Dicstostemma*

Vertex prolonged filiformly; ocelli about as far from one another as from an eye; antennae short. Tegmina reticulate apically...........................2 *Bascarrhinus*

Vertex not prolonged filiformly; ocelli about twice as far from another as from an eye; tegmina not reticulate.3 *Cicius*

Pronotum crested.............................4 *Zyzza*

Pronotum not crested ............................(7)

Pronotum with 2, compressed, diverging horn-like appendages ..................................5 *Zyzzogeton*

Pronotum with 2 crescentiform tubercles...........................6 *Leucopepla* (type *Tettigonia bituberculata* Sign.)

Vertex triangular, strongly narrowed, with a filiform, non-articulated, apical process...........................(9)

Vertex rounded apically (or if triangular, then not produced) .........................................(12)

Vertex triangular, with a subfoliaceous (or foliaceous?) process which curves back so as almost to touch the pronotum ..................................7 *Wolfella.**

Vertex not gradually passing into the apical process, which is much narrower than the apex of the vertex proper; fore tibiae dilated.............................10 *Rhaphirhinus*

Vertex gradually merging into the apical process; fore tibiae scarcely, if at all, dilated.......................(10)

Vertical prolongation widening a little apically, not sulcate, truncate; vertex indistinctly sulcate.............................11 *Syringophora* (type *Tettigonia brevis* Walker).

a Vertical prolongation narrowing to the apex, sulcate; vertex distinctly sulcate...............................(11)

Pronotum posteriorly truncate..............12 *Acrobelus*

a Pronotum posteriorly emarginate...... 13 *Catorthorrhinus*

Fore tibiae flat or sulcate..........................(13)

a Vertex longitudinally sulcate; pronotum nearly always distinctly narrowed in front; hind margin of propleura distinctly rounded or produced.......................(18)

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* 8 *Splonia* and 9 *Propetes* seem to be allied here, but I have not the description of e former and do not know either in nature.

14 Frons obtusely prominent, not longitudinally impressed; vertex not longer than its width between the eyes.....(15)

14a Frons nearly straight in profile; vertex longer than its width between the eyes..................................(16)

15 Clavus with 2 veins (sometimes united in the middle for a short space)..............................14 *Oncometopia*

15a Clavus with one vein, which forks close to the apex and to the base..................................15 *Dichrophleps*

16 Vertex not shorter than the pronotum; frons lightly convex, not gibbous; clavus with 2 veins uniting medianly.(17)

16a Vertex shorter than the pronotum; frons fairly convex or gibbous basally; claval veins distant..........16 *Cyrtodisca*

17 Vertex triangular, apex narrowly rounded, sensibly narrowed up to the apex in profile..................17 *Phera*

17a Vertex wider apically, semicircularly rounded there, sensibly narrowed in profile, with the apex obtuse.......................................................18 *Homalodisca*

18 Fore tibiae simple.................................(19)

18a Fore tibiae dilated.................................(22)

19 Clypeus strongly elevated, gibbous, angulate in profile.(20)

19a Clypeus convex, but not angulately gibbous, in profile.........................................19 *Aulacizes*

20 Pronotum and scutellum about equally long........(21)

21a Pronotum narrowed anteriorly, scarcely impressed anteriorly ..................................22 *Amblydisca*

22 Tegmina apically rounded..................23 *Proconia*

22a Tegmina widely truncate apically....................(23)

23 Fore tibiae moderately dilated; ocelli strongly distant...........................................24 *Acrocampsa*

23a Fore tibiae enormously roundly dilated; ocelli rather nearer to one another than to the eyes..............................25 *Cymbalopus* (type *Tettigonia bigibbosa* Sign.)

24 Vertex much longer than pronotum, depressed, not sulculate, lateral margins bidentate..............................................26 *Ochrostacta* (type *diadema* Burm.)

24a Vertex not (or scarcely) longer than the not (or scarcely) transverse pronotum, lateral margins not dentate (juga slightly prominent near the eyes)...................(25)

25 One vein in the clavus......................27 *Pherodes*

25a Two veins in the clavus....................28 *Acrogonia*

26 Tegmina hairy............................29 *Trichogonia*

26a Tegmina not hairy.................................(27)

27 Tegmina apically reticulate; vertex mostly longer than the pronotum.................30 *Acopsis* (=*Draeculacephala.*)
27a Tegmina not, or only very slightly, reticulate. Vertex rarely as long as the pronotum.........................(28)
28 Fore tibiae incrassate and compressed ......31*Lissoscarta.**
28a Fore tibiae not incrassate or compressed..............(29)
29 Vertex obtusely rounded anteriorly, not sulcate, frons inflated; tegmina rounded apically, rarely slightly truncate. ..............................................(30)
29a Vertex flat, sulcate, forming an acute angle with the lightly convex front; tegminally apically truncate or sinuate truncate .............................. 33 *Diedrocephala*
30 Wings deeply fissured at the anal area which forms a dilated lobe. Vertex wider than pronotum........34 *Dilobopterus*
30a Wings normal....................................(31)
31 Second segment of antennae very long........35 *Poochara*
31a Second segment of antennae short..........36 *Tetigonia.***

## Tribe Megophthalmini.

The Megophthalmini contain apparently three genera, viz: *Megophthalmus*, *Paropulopa* and *Kahavalu.*

## Membracidae.

Since the publication of my first Memoir, I have acquired a copy of Fairmaire's "Revue de la Tribu des Membracides" ***, which has thrown a little light on one or two points. There still remain, however, several species which I suppose belong to *Centrotypus*, but cannot determine satisfactorily at present.

### *Zanophara.*

### 1. *leda* sp. nov.

=*Z. tasmaniae* (?) Kirkaldy (nec Fairm.).

Differs from *Z. tasmaniae* (Fairm., God.) as follows:

Head concolorous with pronotum, reddish-pitchy. Tegmina basally, subcostal cell, clavus, veins, &c., opaque reddish-pitchy, apically subhyaline, yellowish-ferruginous. Legs reddish-pitchy. Ocelli a trifle nearer to one another than to the eyes. Both angles of the apex of the pronotal horns acute, the exterior one more so, the horn distinctly longer and slenderer.

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* 32 *Sphaeropogonia* apparently is allied to this.

** With subgenera *Amblyscarta* (type *modesta* Fabr.) and *Poeciloscarta*,(type *cardinalis* Fabr.) ;37 *Conogonia* and 38 *Sphinctogonia* are allied to *Tettigonia*. *Phereurhinus* I do not know.

*** 1846, A. S. E. France, (2) iv, 235-320 & 479-531, Pls. 3-7.

*Female*: abdomen beneath reddish-pitchy.

Length 8¾ mill.

Hab. New South Wales, Mittagong (Jan.) arboreal.

### 2. *albovittata* sp. nov.

=*Z. vitta* (?) Walker, Kirkaldy.

Differs from *vitta* (Walk., God.) as follows:

Median keel of pronotum pitchy basally. Tegmina basally, anal cell of clavus apically, subcostal cell, a stripe (entire, not bifurcate) along the middle of the corium, &c., smoky ferruginous, veins ferruginous. Ocelli practically equidistant from one another and eyes.

[Third apical cell with a transverse venule on one tegmen.]

Length 6 mill.

Hab. Queensland, Bundaberg (Sept.-Dec., K.).

## *Acanthuchus.*

As Goding remarks, the differences between *Centrotypus* & *Sertorius* seem to be very feeble. In addition, I cannot draw any dividing line between these and *Acanthuchus.*

### 1. *iasis* sp. nov.

Differs from *Centrotypus occidentalis* and *minutus* by the small first "discoidal," and the upwardly elevated, not small, horns.

Reddish-pitchy, pronotal keel blacker on the disk. Tegmina ferruginous, basal veins reddish-pitchy, apically ferruginous. Tibiae, tarsi and apices of femora yellow-ferruginous. Ocelli a trifle nearer one another than to the eyes, yellow brown. Horns placed much as in *Zanophara leda*, but acute and turned outwards and upwards. Pronotal process reaches to apex of tegmina.

Length 5-5¾ mill.

Hab. Queensland, Kuranda (Aug., type), Cairns (Aug.)

### 2. *euryone* sp. nov.

Allied to the last, but less elongate and more robust. Redder, the pronotal keel concolorous, process ferruginous. Ocelli distinctly nearer to the eyes than to one another, yellow brown. Tibiae and tarsi reddish pitchy. Tegmina vitreous, scarcely tinted, base and subcostal cell opaque, ferruginous; third apical cell elongate, narrow, interior side curving a little towards the exterior; first discoidal hemisphaerical, two-thirds the length of the first. Horns a little farther apart basally than in *A. iasis*, and a little shorter and blunter. The venation in some examples is irregular.

Length 5 mill.

Hab. New South Wales, Sydney (Feb.).

3. *eurynomus* sp. nov.

Fairly close to the last, but the horns are shorter and more depressed. Interior margin of third apical cell straight; first discoidal cell smaller, about half as long as the second. Legs less *yellowish*-ferruginous.

Length 5 mill.

Hab. Queensland, Bundaberg (Sept.-Dec.)

4. ? *bispinus* Stal.

In the absence of species for comparison, several forms are temporarily determined as above. It seems as much a *Centrotypus* as an *Acanthuchus*.

Hab. Queensland, Cairns (July-Aug.), Brisbane (Nov.)

## CLASSIFICATION OF THE FULGOROIDEA.

Stal's classification of 1866, followed almost entirely by authors since that date, although separating the various groups fairly well, places the last *seven* in a parallel series, with more or less overlapping characters, an obviously unnatural arrangement. So many of the Fulgoroid genera are unknown to me in nature, however, that I am prevented from any thoroughgoing revision and can only offer some hints.

Hansen has laid great stress on the structure of the antennal sensory organs. My own researches confirm this, but at present I do not think it is practicable. Selected forms display the characters very sharply, but in a large number, it is impossible to see anything definite at a magnification of 188 diameters, and it is impracticable to focus a compound microscope nearer, without dissection, in the case of such minute antennae as those of many Achilini, Ricaniinae, &c., and many forms are still known only as uniques.

I have therefore used the venation principally, especially the condition of the costal vein.

I have given little value to one of Stal's principal characters, viz: the running of the anal vein into the commissure or into the apex of the clavus, as all intermediate stages are present and it separates obvious allies.

The arrangement of sensory organs on the nymphs will probably be of great value, but from lack of certain definite material I cannot elaborate certain clues I seem to have found.

The following is an *attempt* at a more natural grouping:

## Fam. 1. Poekillopteridae.

Costal vein fully developed, costal area nearly always with cross veins (*). Pronotum nearly always truncate behind. Subapical transverse line or lines on tegmina. (†)

### Subfamily 1. Lophopinae.

Head narrower than pronotum; labium short, stout, the last segment short. (The antennal sensory organs appear to have an encircling of a few upright spines). Pronotum basally truncate. Costal vein fully developed, costal area with cross veins. No properly defined subapical transverse line or lines on the tegmen. Clavus not granulate. Hind tibiae spinose. First segment of hind tarsi short and stout.

Embraces 12 genera, the 7 established or confirmed by Stal, as well as *Astorga*, *Brixioides*, *Bisma*, *Jivatma* and ***Pitambara***. Distant describes species in *Serida* and *Zamila*, appearing to have overlooked the fact that Stal has cited *Zamila* as a synonym of *Pyrilla*, and stated that *Serida* was not to be distinguished from *Lophops*. The structure of the head and the venation exclude *Kusuma*, *Varma* and *Padanda* placed here by Distant.

### Subfam. 2. Tropiduchinae.

Clavus not granulate. Pronotum tricarinate, emarginate behind. Hind tibiae spinose, first segment of hind tarsi usually somewhat long.

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* Except *Ossa*, *Tambinia*, and etc.

† Except the *Lophopinae*.

### Tribe 1. Tambiniini.

Costal area very narrow, not veined transversely. *Isporisa*, *Colgorma*, *Ossa*, *Tambinia* and perhaps *Paricana*, &c.

### Tribe 2. Tropiduchini.

Costal area broad, veined transversely. *Kusuma*, *Varma* and *Baruna* (the two first placed by Distant among the Lophopidae to which they have no resemblance, superficial or otherwise); *Conna*, *Elica*, *Rhotala*, *Daradax*, *Ficarasa* and *Epora*; *Stacota*, and *Tropiduchus*, *Eodryas* (*), *Peltodictya*, *Vanna*, *Rhinodictya* and *Peggioga*, and *Plegmatoptera*, (the latter placed by Stal in the Dictyophorini!).

## Subfam. 3. Ricaniinae.

Clavus not granulate. Pronotum unicarinate, emarginate behind. Hind tibiae spinose, first segment of hind tarsi usually rather short.

### Tribe 1. Bladinini (=Nogodini auctt.)

Frons not wider than long, lateral margins of clypeus keeled. This runs very close to certain Tropiduchini.

### Tribe 2. Ricaniini.

Frons not longer than wide, lateral margins of clypeus keeled.

## Subfam. 4. Poekillopterinae.

Clavus granulate; hind tibiae spinose. Cross veins in costal area, and unusually a transvere line on the apical part of the tegmen.

### Tribe 1. Poekillopterini (=Flatinae).

### Tribe 2. Phalaenomorphini (=Flatoidinae).

## Family 2. Issidae.

Costal vein usually developed, tegmina often coriaceous and reduced; clavus not granulate. Sensory organs on antennae not surrounded by spines.

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*** New name for *Epora* Mel. 1903 nec Walker, 1857, which is allied to *Kusuma* (Distant.) Melichar has described and figured it; type *melichari***

### Subfam. 1. Amphiscepinae.

Costal vein apparently not developed, tegmina Poekillopteriniform, much reticulated as a rule. Hind tibiae not spinose. Frons not angulate laterally. There are only about 5 genera in this little group, *Amphiscepa* (=*Acanalonia*), *Chlorochara*, *Thiscia*, *Philatis* and *Parathiscia*.

### Subfam. 2. Issinae.

Costal vein fully developed, or if not then the tegmen more or less coriaceous, with reduced venation. Hind tibiae spinose. Frons not angulate laterally.

This large group of nearly 80 genera runs very close to the Amphiscepinae on the one hand and to the Poekillopterinae on the other.

### Subfam. 3. Eurybrachyinae.

Costal vein rarely not developed. Hind tibiae spinose. Frons angulate laterally (except *Gedrosia*). Tegmina usually coloured and opaque. Distant has placed an intrusive 'd' in this name: and places the group next to the Fulgorinae, probably because the tegmina are coloured.

## Family 3. Tetigometridae.

This small family is usually placed among the Issinae. It differs from all the preceding by the segmented antennal bristle, the peculiar form of the antennal sensory organs and the general Tetigonioid appearance.

*Brachyceps*, *Hilda*, *Egropa*, *Eurychila*, *Mitricephalus* and *Tetigometra*.

## Family 4. Fulgoridae.

Claval vein not granulate; costal vein not developed. Hind tibiae nearly always spinose, without a mobile spur. Sensory lobes present on antennae, bristle not segmented.

### Subfam. 1. Cixiinae.

Anal vein of wing not reticulate.

### Tribe 1. Cixiini.

Often 3 ocelli. Tegmina not reticulate apically, the anal vein runs into the commissure.

### Tribe 2. Achilini.

Doubtfully distinct from Cixiini and only retained for convenience. Two ocelli always; the anal vein runs into the apex of the clavus. *Chroneba*, *Kirbyana* and *Melandeva* placed in the 'Cixiinae' by Distant, do not agree with his characters, but belong here. *Kinnara* and *Paruzelia* perhaps belong here.

### Tribe 3. Dictyophorini.

Not easily distinguished from the preceding by words, but of different habitus. Tegmina usually reticulate apically.

*Augila* (placed by Distant in the Issinae), *Leusaba* and *Monopsis* (placed by Distant in the Tropiduchinae) belong here. In *Leusaba*, the anal vein runs into the apex of the clavus.

### Subfam. 2. Fulgorinae.

Anal area of wings reticulate. Tribes Fulgorini, Aphanini and Omalocephalini.

### Fam. 5. Asiracidae.

Hind tibiae with a mobile spur; antennal sensory lobes absent, bristle segmented; costal vein not developed, clavus not granulate.

### Fam. 6. Derbidae.

Clavus granulate (except in a few forms); anal area of wings (in most forms) with a stridulatory area. Hind tibiae without a mobile spur. Antennae often very remarkable, bristle not segmented. Costal vein not developed. Last segment of labium rarely otherwise than annuliform.

*Vekunta*, placed by Distant in the Achilinae, is a Derbid.

"*Hieracia*" *walkeri* Sign., is very evidently not a *Hieracia* at all. I am of the opinion that it forms a group near there somewhat intermediate between Issinae and Tropiduchinae, together with *Karna*, *Amfortas*, *Hieracia*, *Grynia*, as well as *Flavina* and *Nilalohita*, (the two latter placed by Distant in the Issinae) and perhaps *Padanda* (of Distant's Lophopidae!). Signoret's species forms the new genus *Dolia*, distinguished from *Hieracia* by the greater number of tibial spines. It seems to be near *Flavina*, but the face is very different; it seems also near *Nilalohita*, but the clypeus is differently formed. Type *walkeri* Sign.

There seem to be therefore, in the Fulgoroidea, four principal types:

1. The Poekillopteroid, in which the costal vein is well developed. While such forms as *Lophops* and *Flata* seem little allied, yet the Ricaniinae form a link which it is hard to break.
2. The Issoid, in which the costal vein is usually developed. I think the Amphiscepinae (including *Acanalonia*, &c.) clearly belong here and not to the Poekillopteridae. *Tonga* is a remarkable form of uncertain affinities; I placed it at first among the Poekillopteridae. The Tetigometridae form a distinct family of apparently "degraded" Issidae.
3. The Fulgoridae have the costal vein obsolescent except basally. The Asiracidae are apparently developed from forms like *Oliarus*, but their many peculiarities render their separation necessary.
4. The Derbidae are probably polyphyletic, *Nisia*, *Lamenia* and some other forms approaching the Cixiini and Achilini.

The first and second groups apparently oviposit on the outer surface of leaves, while the third make an incision in the leaf or stem and place the eggs inside. Of the Derbidae, no eggs have, I believe, been found in nature.

Mr. Distant has recently criticized parts of my former memoir, relating to the Fulgoroidea, in the A. M. N. H. (7) XIX, 395-416 (1907)*. Those acquainted with Mr. Distant's works will, I am sure, wonder that Mr. Distant should complain of incomplete and rudimentary descriptions in other workers. I have considered his synonymical propositions in their several places. I may point out here however that Mr. Distant has so "carefully studied" my memoir, that he has misunderstood the scope of the entire work, the nature of which is plainly indicated even on the title page of the parts.

### Poekillopteridae.

### Lophopinae.

### *Astorga*.

Stal (1866 Hem. Afr. IV) places the "Lophopida" among those groups in which the anal vein runs into the apex of the clavus or into the sutura clavi. Melichar (1903 Hom. Ceylon) incorrectly characterizes it as "Head and eyes together as wide as the pronotum" (added to Stal's character of the anal vein running into the claval suture), although he includes therein *Elasmoscelis radians* and *platypoda* in which the head is much narrower than the pronotum. *Astorga* bears a very close general resemblance to *Lophops,* but the anal vein clearly runs into the commissure: however, it is best located in the Lophopinae at present. It may be distinguished from *Lophops* by the form of the tegmen.

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* See my reply op. cit., later.

1. *saccharicida.*

On Pl. XXVIII, f. 11, of my former contribution, an ocellus should have been depicted between the apex of the antennae and the anterior margin of the eye, a little inwards; a nymph of this species is figured on Pl. I, figs. 8-9.

I do not regard *Kusuma, Varma* and *Padanda* of Distant as Lophopid.

### Tropiduchinae.

The following are now figured:

*Rhinodictya quaesitrix*, Pl. IX, figs. 12-13.

*Peltodictya kurandae* Pl. VIII, figs. 3-4.

Distant (1907 A. M. N. H. (7) XIX, 416) cites *Peltodictya* as synonymous with *Ficarasa* Walker. In the latter, however, the apical cells of the tegmina are reticulate, while there are no cross veinlets at all in *Peltodictya* from the apical margin right up to the subapical line.

It may be useful to point out that Mr. Distant's correction of the misprint in the reference to the figures of *Vanua vitiensis* is itself incorrect. As mentioned in the 'Errata' at the commencement of the volume, *Vanua vitiensis* adult is figured Pl. XXVIII, figs. 7-9 and the nymph on Pl. XXVII, figs. 6-7.

The following have been described as Tropiduchinae:

*Ficarasa australasiae* Distant 1907, op. c., 287, Queensland (very probably belongs to my genus *Peltodictya*).

*Magia subocellata* Distant, op. c., 288, do.

I regard the following genera as Tropiduchine:

*Plegmatoptera,* placed in the Dictyphorinae by Stal.

*Kusuma* and *Varma,* placed by Distant in the Lophopinae. I do not regard the following genera as belonging to this subfamily, viz: *Leusaba, Hiracia, Karna* and *Paruzelia.* I also follow Ashmead and Swezey in placing *Monopsis* Spinola (=*Nonopsis* Distant) among the Dictyphorinae; it certainly is not Tropiduchine as Distant pretends. (See A. M. N. H. (7) XVIII, 356).

### Ricaniinae.

### *Euricania.*

#### *tristicula.*

Hab. Viti Levu, (Mar., K.), Rewa (Dec., Apr., M.).

### *Plestia.*

#### 1. *marginata.*

*Plestia do.* (Montr.) Melichar 1898 Ann. Mus. Wien. XIII. 294, Pl. XII, f. 17; Pl. XIV, f. 1.

Hab. Viti Levu, Rewa (Feb.-Apr., M.).

The parts described in previous descriptions as yellow, are pale opaque green, in fresh examples.

### *Gaetulia.*

Distant (p. 394) states that the head is considerably narrower than the pronotum. This is incorrect as a generic character, for in *G. chrysopoides,* the eyes project very slightly beyond the pronotum; Distant's figure (203) also scarcely bears out his diagnosis, moreover the clypeus is *not* carinate, as indeed Stal also states.

### Poekillopterinae.

### *Siphanta.*

The Australian species may be disposed as follows:

1. Vertex distinctly longer than wide.............1 *galeata*

1a. Vertex not longer than wide..........................2

2. Vertex scarcely (if at all) wider than long; species 8 mm. long (or more)......................................3

2a. Vertex nearly (or quite) twice as wide as long; [tegmen with dark scattered granules]; species not more than 8 mm. long. ....................................7

3. Reddish (or blackish) granules on tegmen, especially on clavus. .........................................4

3a. No reddish (or blackish) granules on tegmen (*)........6
4. Vertex angulate, sutural angle of tegmen rounded......5
4a. Vertex rounded, sutural angle acute..........2 *acutipennis*
5. Vertex longer than pronotum, frons scarcely longer than wide (typically with a yellow stripe on tegmen).....3 *toga*
5a. Vertex and pronotum equally long, frons twice as long as wide. ....................................3a *patruelis*
6. Anterior margin of pronotum entire (truncate or rounded) ........................................ 4 *acuta*
6a. Anterior margin of pronotum notched minutely in the middle .................................... 5 *breviceps*
7. Species under 6 mm. long .................6 *granulicollis*
7a. Species 6 mm. or over ..............................8
8. Colour of tegmina pinkish testaceous........8 *granulata*
8a. Colour of tegmina orange yellowish............7 *lucindae*
8b. Colour of tegmina greenish or yellowish green..........9
9. Granules on corium few, small and inconspicuous; pronotum without a red line; disk of scutellum with one green line ....................................9 *subgranulosa*
9a. Granules large and conspicuous, pronotum with a red longitudinal line, disk of scutellum with three green lines.... ........................................ 10 *sensilis*

N. B. *rubra* Schmidt remains unrecognizable to me.

### 1. *galeata*.

Pl. V, fig. 3 & Pl. VI, figs. 3-4.

### 2. *acutipennis*.

Pl. III, fig. 1 & Pl. VI, figs. 1-2.

The reddish and blackish granules on the tegmen, as well as some usually conspicuous crimson spots, distinguish this at once from *S. acuta*.

### 3. *toga*

Pl. III, fig. 3 & Pl. VII, fig. 11.

The Bundaberg record should be deleted, and on p. 455 line 3, for "tatter" read "latter."

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* This does not refer to the exceedingly minute greenish, yellowish or brownish granules numerous in each (or most) of the reticulations on the tegmen.

### 4. *acuta.*

Pl. III. figs. 2 & 4 · Pl. VI. figs. 13-14.

This species is also a little variable as regards the apical margin of the tegmen. In some examples it is slightly but distinctly concavely emarginate, in others slightly convex, and it varies a little as regards the prominence of the sutural angle. The ova in situ and the last nymphal instar are figured on Pl. VI, figs. 17-20.

### 5. *breviceps.*

Pl. III. fig. 2.

Allied to *acuta*, not to *acutipennis*.

### 6. *granulicollis.*

Pl. IV, fig. 2 & Pl. VI, figs. 7-8.

The vertex, in what I suppose to be this species, is usually obtuse-angled, but varies from that to being distinctly rounded. The scutellum is shorter than in the other species, the disk is typically brownish-red with one longitudinal green stripe.

Length: 5 to 5⅞ mill.

Hab. New South Wales, Sydney (Jan.-Feb.) Mittagong (Jan.)

The *S. minuta* of Melichar is perhaps a variety of this, introduced into Saint Helena. In all the species of *Siphanta* I have seen, the apical margin of the tegmen is always spotted with crimson, though sometimes extremely faintly, as probably is the case with *S. minuta*.

### 7. *lucindae.*

Pl. IV, fig. 3 & Pl. VI, figs. 5-6.

### 8. *granulata.*

Pl. IV, fig. 4.

Very close to the last, but yellower, and more granulate on the corium.

### 9. *subgranulosa.*

(=*granulicollis* Kirkaldy olim, nec Stal)

Pl. V, fig. 1 & Pl. VI, f. 12.

Hab. Queensland, Cairns (July-Aug., P.), Bundaberg (June P.). This possibly =*S. rubra* Schmidt.

### 10. *sensilis*, sp. nov.

Pl. IV, fig. 1, & Pl. VI, figs. 15-16.

Allied to *granulicollis*, but larger, the corium with more granules which are also larger individually. Pronotum green with one red stripe. Disk of scutellum brownishred with three green stripes.

Length 6 to 6½ mill.

Hab. Queensland, Cairns (July-Aug.).

## *Thanatochlamys* gen. nov.

Allied to *Siphanta*, but the vertex is short, narrow, flattish but a little swollen along the middle, very slightly ascendant, not granulate. Frons elongate, with 5 strong keels. Clypeus not, or obtusely, keeled at the side. Pronotum granulate, strongly keeled medianly. Scutellum shining, not granulate, flattish though a little inclined to be swollen anteriorly. Venation different, angles of tegmina not prominent. Tibiae with one spine.

### 1. *tristis* sp. nov.

Pl. V, fig. 4 & Pl. VI, figs. 9-10.

Vertex and pronotum olivaceous with paler keels and granules. Frons and scutellum fuscous with paler keels. Clypeus, legs, abdomen beneath, etc., fuscotestaceous. Clavus olivaceous with blackish granules, corium dark fuscous with paler veins and blackish granules basal two thirds of exterior margin paler.

Length 7¾ mill.

Hab. Queensland, Cairns (July).

## *Phantiopsis.*

*Phantiopsis* Melichar 1905 Ann. Mus. Hung. III, 474.
=*Aphanophantia* Kirkaldy 1906, op. c., 458.

### 1. *australiaca.*

Pl. VII, figs. 4-6.

*Phantiopsis australiaca* Mel., l. c., 475.
=*Aphanophantia cuscuticida* Kirk., l. c., 459.

## Issidae.

This family contains three subfamilies:

1 Face not laterally angulate..........................(2)
1a Face laterally angulate.................3 Eurybrachyinae
2 Hind tibiae with a spine or spines................1 Issinae
2a Hind tibiae spineless in adults (but spinose in nymphs)...................................2 Amphiscepinae

## Issinae.

The following table is amended from the first memoir:

1 Tegmina reaching at least to apex of abdomen, clavus sutured off from corium ........................(2)
1a Tegmina in the form of narrow, elongate straps, reaching far beyond the apex of the abdomen; wings rudimentary; hind tibiae with two spines..............10 *Alleloplasis*
1b Tegmina abbreviated, clavus not sutured off from corium; wings rudimentary; hind tibiae with one spine..............................................9 *Gelastissus*
2 Wings reaching at least to apex of abdomen...........(3)
2a Wings absent or rudimentary........................(6)
3 Appearance Cercopoid; wings deeply incised apically...(4)
3a Appearance Poekillopteroid; wings not incised apically.........................................4 *Tylana*
4 Frons longitudinally carinate, sometimes feebly; inner fork of radial vein practically forming a straight line with the basal stalk of the vein ........................(5)
4a Frons polished, not carinate; inner fork of radial forming an obtuse angle inwardly, with the basal stalk of the vein.......................................3 *Phacopteryx*
5 Tegmina less than 2½ times as long as broad, inner fork of radial vein not reforking till just basal of the apical margin.............................1 *Chlamydopteryx*
5a Tegmina over 3 times as long as broad, inner fork of radial reforking well basal of the apex of the clavus.......................................2 *Apsadaropteryx*
6 Hind tibiae with 1 spine ..................5 *Lipocallia*
6a Hind tibiae with 2 spines..........................(7)
7 Hind margin of pronotum straight...................(8)
7a Hind margin of pronotum widely emarginate.....6 *Bilbilis*
8 Frons basally truncate, with a keel along the middle.......................................7 *Hysteropterum*

8a Frons medianly emarginate at base, with a median and a circular keel ................................ 8 *Orinda*

*Chlamydopteryx* gen nov.

Allied to *Sarima* Mel., but the venation is different. Head and pronotum not at all flush. Circular keel of frons continuous and the apico-lateral part of frons a little lobate. Frons granulate around the keel. Fore tibiae somewhat widened. Type *vulturnus.*

1. *vulturnus.*

Pl. VII, figs. 15-16.

*Issus vulturnus* Kirkaldy.

2. *ridicularius.*

Pl. VII, figs. 12-14.

*Issus ridicularius* Kirkaldy.

In both these species, part of the frons is visible dorsally, the base of the rounded basal carina being visible above as a straight keel; vertex almost truncate basally. The outer branch of the radial vein is strongly arched basally. In *C. ridicularius*, the clypeus is striate, a character however probably not very important.

5. *eurobium* sp. nov.

Allied to the last, but the colour is browner. Vertex more transverse, the apical margin almost truncate, frontal keels very feeble. Outer branch of radial angularly bent near the base, as seen from above.

*Male*: pygophor as in *C. ridicularius.*

Length 5 mill.

Hab. Queensland, Cairns (August).

*Apsadaropteryx* gen. nov.

Allied to *Sarima*, but the subcircular keel of the frons is continuous except at the apical margin and the clypeus is slightly striate; the veins of the tegmen are strongly marked and the inner fork of the radial vein reforks well basal of the apex of the clavus. Fore legs not widened.

1. *elongatulus.*

Pl. VII, figs. 9-10.

*Issus elongatulus* Kirkaldy, l. c.

*Phacopteryx* gen. nov.

Differs from the above by the exterior branch of the radial vein being almost rectangularly bent near its base; the subcostal cell apical of this bending is very narrow, with numerous transverse veins. Frons broader than long, convex medianly, no keels except the transverse basal one, but the lateral margins are flat, posterior margin emarginate. Base and lateral margins of frons, the pronotum, &c., strongly granulate.

1. *sidnicus.*

Pl. VII, figs. 20-1.

The nymph of this is figured (figs. 17-19).

*Orinda* gen. nov.

Allied to *Hysteropterum,* but the frons basally is emarginate with acute lateral angles, and the venation is quite different. Vertex transverse, truncate apically and basally. Costal margin roundly dilated at the base, then subconstricted. Wings rudimentary.

1. *lucindae.*

*Sarnus lucindae* Kirkaldy, op. c., 440.

*Tylana.*

*Tylana* (Stal) Melichar 1906 Abh. Zool. bot. Ges. Wien III (pt. 4) p. 198.

1. *acutipennis.*

Pl. VII, figs. 1-3.

*Lollius acutipennis* Kirk.

This is not *Tylana acutipennis* Mel., which is differently coloured and has the submedian frontal keels uniting with the median well apical of the base of the frons (and not almost at the base) and more arched laterally. (*)

### 2. *angustifrons.*

*Lollius angustifrons* Kirkaldy.
*Tylana conspurcata* Melichar, l. c., 203.

Of unrecorded Australian forms, I now add *Bilbilis modestum* Stal, from "North Australia" and New South Wales.

Mr. Muir did not collect any Issinae in Fiji, but the following are noted by Melichar:

*Tylana intrusa* Melichar, and *T. orientalis* Mel., from Ovalau, and *T. piceus* (Walker) from Viti Levu, the last named also from Aru and Papua. The Genus *Tylana* has an interesting distribution viz.: North America (1 sp.), Borneo (1 sp.), Celebes (2 sp.), Papua and neighboring isles (6 sp.), New Caledonia and Lifu (3 sp.), Australia (2 sp.), Fiji (3 sp.), Samoa (1 sp.), and the Mascarene Isles (2 sp.).

In Bulletin IV of this division (1907), I described one new Issine from North America, and doubtedly identified another. I have been able since to confirm these by Melichar's Monograph, *Bruchomorpha mormo* being allied to *B. pallidipes* Stal, but quite unicolorous, except part of the legs, as described. *Picumna ovatipennis* may be confirmed.

### Eurybrachyinae.

I must leave my former notes in the same unsatisfactory state, as I still do not know what Stal meant to define precisely by his genus *Platybrachys*.

Recently (1906 A. M. N. H. (7) XVIII) Distant has described one genus and 3 species from Queensland, as new. *Yarrana* 206, seems to differ from *Dardus* Stal, only by the much longer tegmina.

1 *sinuata* 207; Queensland, Townsville, Karanda (sic!) and Cairns.
2 *continuata* 207; Queensland, Townsville.
*Olonia* Stal.
6 *marginata* 206; Queensland.

Distant (1907 op. c., XIX, 415) very confidently synonymizes *Dardus immaculatus* Kirkaldy with *D. obscurus* Distant. The

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[*] For *Tylana acutipennis* Mel., which is a Bornean species, I propose the name *T. dyakana*.

latter however has the face and legs pale sanguineous, while in the former the face is uniformly dark brown (except for some pale and clypeal specks), and the hind femora only are sanguineous, the rest of the legs being piceous except as indicated in my description.

## Fulgoridae.

### Cixiinae.

Distant, following Melichar, places *Kirbyana* in the "Cixiinae," despite the fact that the anal vein reaches the apex of the clavus, that there are only two ocelli and that the clypeus is laterally carinate, a combination of characters which according to Distant himself, would place the genus in the "Achilinae." He also places the genus *Kinnara* in the "Achilinae," but there are three ocelli here and the anal vein scarcely reaches the apex of the clavus; it therefore belongs to the "Cixiinae."

#### Tribe Cixiini.

The Australo-Fijian genera fall into groups as follows:

1 Antennae elongate, distinctly visible beyond the lateral margins of the head ............................ 4 *Solonaima*
1a Antennae minute .................................... (2)
2 Scutellum with 5 keels ............................ (3)
2a Scutellum with 3 keels ............................ (4)
3 Vertex extending but little beyond the eyes, face not foliaceous ........................................ 1 *Oliarus*
3a Vertex extending well beyond the eyes, face subfoliaceous laterally .................................. 2 *Urvillea*
4 Frons with 3 distinct ocelli ........................ (5)
4a Frons with 2 ocelli .................................. (6)
5 Tegmina widely rounded towards the apex .....6 *Leirioessa*
5a Tegmina long and narrow ......................5 *Myndus*
6 Head produced in front of eyes, vertex elongate........(7)
6a Head scarcely produced, vertex not elongate..........(10)
7 Tegmina of usual *Cixius*-form..................... (8)
7a Tegmina (as seen dorsally) strongly compressed ....(9)
8 Tegmina not granulate..................... 3 *Nesocharis*
8a Tegmina strongly granulate ...................7 *Carolus*

Genae very clearly separated posteriorly, lateral margin of frons remote from eyes, ocelli and antennae........... ................................ 8 *Gelastocephalus*
Genae much narrowed posteriorly, lateral margin of frons close to eyes, ocelli and antennae .........9 *Nesochlamys*
Head dorsally doubly carinate transversely. . 10 *Leptochlamys*
a Head not carinate transversely below the front margin. . (11)
Tegmina of usual *Cixius*-form..............11 *Calamister*
a Tegmina strongly compressed (as seen dorsally)......(12)
Base of vertex slightly emarginate..........12 *Australoma*
a Base of vertex truncate ..........................(13)
Pronotal emargination anteriorly nearly touching base of vertex ................................ 13 *Dystheatias*
a Pronotal emargination not nearly touching base of vertex.. ................................... 14 *Quirosia*

*Oliarus.*

Four species are now added, 3 from Fiji, and 1 from Queens- ıd. I regret that I have not had time to study the genitalia of e species, as these present good characters. The following table mprehends the 12 Australo-Fijian species now known.

Apices of the first and second segments of the hind tibiae each with about twenty small spines which do not (or at least only one or two of them) extend beyond the apical margin of the segment (subgenus *Nesopompe* nov.) . . (2)
Apices of these segments with from 5 to 8 (according to the species) larger spines which mostly extend well beyond the apical margin of the segment (*Oliarus* sens. str.) . . (3)
Tegmina hyaline (type of subgenus).............11 *felis*
Tegmina hyaline, the apical fourth smoky. . . . 12 *saccharicola*
Axillary vein of tegmen running into anal vein, basal of the middle of the latter ............................(4)
Axillary running into anal at, or apical of, the middle of the latter .................................... (8)
Axillary very short, not quite half (taken from its curving or angulation at the commissure) the length of the stalk of the anal ..............................1 *laertes*
Axillary long, more than half the length of the stalk of the anal ...................................... (5)
Tegminal veins more or less thickly granulate ........(6)
Tegminal veins not, or obsolescently, granulate. . 2 *kampaspe*

6 Veins basal of the membrane dark. ................3 *asaica*

6a Veins basal of the membrane pale, with dark granules..(7)

7 Head and scutellum pale ........................4 *talunia*

7a Head and scutellum black and castaneous..........5 *lilinoe*

8 Vertex much narrower at the base than an eye..........(9)

8a Vertex scarcely, or not, narrower at the base than an eye ............................................ (10)

9 Lateral margins of vertex forked at the anterior margin of the eyes, so that the anterolateral margins of vertex do not reach the apical margin and are connected therewith by 2 very short, parallel, keels ................6 *tasmani*

9a Lateral margins of vertex forked well below the anterior margins of the eyes, the inner margins meeting acutely below the anterior margin of the head dorsally and continuing thereto ............................7 *alexanor*

10 Tegminal veins granulate ......................9 *sponsa*

10a Tegminal veins not granulate .........................11

11 Tegminal cross veins thickened, but not widely suffused.. ......................................... 9 *lubra*

11a Tegminal cross veins strongly and widely suffused...... ....................................... 10 *phelia**

### 5. *lilinoe* sp. nov.

Like a large, dark *talunia*, but the venation is different. Differs from *O. laertes* by the veins of the tegmen basal of the membrane being pale (with dark granules), not dark, consequently the dark hue of the suffused cross veins shows up more prominently; also by the greater length of the axillary vein. It is allied to *O. asaica*, but is much smaller, the tegmina are paler and the vertex is much narrower. Frons and clypeus dark fuscous, median keel and lateral margins pale ochraceous. Scutellum dark fuscous; the median keel, the lateral keels and the space between them, and the extreme lateral margins ferruginous.

Length 5¾ mill.

Hab. Queensland, Cairns (July, P.).

### 6. *tasmani* sp. nov.

Allied to *O. alexanor*, but the head form is different and the tegminal granules feebler. Blackish, keels dark ferruginous,

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* Distant has recently described two species, *O. dingkana* and *O. lubra* from Queensland (1907 A. M. N. H. (7) XIX, 282), but it is not possible to identify them from the descriptions. N. B. Since the above was in proof, Distant has renamed his *lubra*, "*incerta*," an excellent name judging by his description.

frons ferruginous, sometimes suffused with fuscous. Pronotum pale, lateral margins fuscous. Tegmina hyaline, veins mostly pale with fairly closely set but not prominent fuscous granules. Subcostal vein yellowish fuscous; stigma dark fuscous; apical veins and subapical transverse veins suffusedly dark fuscous. Wings hyaline, veins dark fuscous. Legs bright yellow, obscurely annulated with fuscous. Vertex as in *O. alexanor*, but the lateral margins are forked at the anterior margin of the eyes, so that the anterolateral margins of vertex do not reach the apical margin and are connected therewith by 2 very short parallel keels. Labium reaches the hind coxae. There are 6 spines each on the apex of the 1st and 2nd segments of the hind tarsi.

*Male*: sterna and abdomen more or less piceous, hooks, &c., pale.

Length (male) 5½ (female) 6⅛ mill.

Hab. Viti Levu, Rewa (Mar., Muir).

The scutellum is sometimes ferruginous between the keels.

The species is named after Tasman, who discovered the Fijian archipelago.

9. *lubra.*

Pl. VIII, figs. 7-9.

A rather smaller race, the males measuring as little as 6 mill., has been found in Viti Levu by Muir (No. 7) in Ba (Jan.), Rewa (Mar.-May) and Navua (Feb.) on Breadfruit. (*Artocarpus incisa*); they may be termed var. *vitiensis.*

10. *phelia.*

Pl. VIII, figs. 10-12.

11. *felis.*

Pl. VIII, figs. 5-6.

12. *saccharicola* sp. nov.

Allied to *O. felis* but distinguished by the smoky apical fourth of the tegmina.

Blackish; keels of vertex, lateral keels of frons and clypeus, legs, &c., pallid; hind femora more or less fuscous; keels of scutellum (usually) and median keel of frons ferruginous. Pronotum pale, latral margins fuscous. Tegmina milky hyaline, apical fourth smoky, veins of basal two-thirds pale, not granulate, veins of apical third darker, with dark fuscous granules. Wings smoky hyaline, veins fuscous. Abdomen more or less blackish.

Length (male) 4½ mill.

Hab. Viti Levu (Muir No. 81), Rewa (Dec., M.), *on Saccharum officinarum.*

### *Urvillea* gen. nov.

The characters of *Oliarus,* but the vertex extends well beyond the eyes; frons and clypeus apparently fused but there is an ocellus in the middle of the facial keel; the face is ampliate and foliaceous in the middle laterally. Tegmina not granulate. Superficially like *Oecleus* but the posterior femora are spined, and the venation is Oliarine. This genus the type of which is *U. melanesica,* is named after the celebrated traveller Dumont d'Urville, who made the first chart of the Fijian group.

### 1. *melanesica*, sp. nov.

Black; head keels (blackened at anterior margin), the foliaceous part of the face, labium (except the blackish fourth segment), legs (except the tarsi which are partly dark), tegulae, &c., yellow or brownish-yellow, lateral margins fuscous. Scutellar keels dark ferruginous. Tegmina hyaline, veins on basal two-thirds brownish-yellow, subcostal and those on apical third dark fuscous; cross veins a little suffused, apical margin narrowly smoky, stigma dark fucous. Vertex parallelsided, nearly four times as long as the basal width extending in profile nearly one-half the length of an eye in front of the latter. First segment of hind tarsi with 6 teeth apically, second with 5. Labium reaching to hind trochanters.

Length (male) 7- (female) 8 mill.

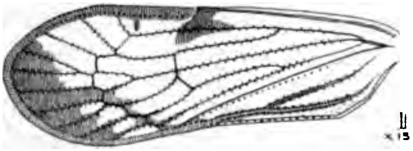
Hab. Viti Levu, Rewa (Mar.- Nov., M.).

### *Nesocharis*, gen. nov.

Apparently not very closely related to any known Cixiine. It differs from *Cixius* by the venation and the simple legs. From *Oecleus* it differs by the basal cell emitting 3 veins.

Vertex excavated, posterior margin acute angularly emarginate. Face elongate diamond-shaped (flat), more than twice as long as wide, widest about the antennae, subconstricted at the frontoclypeal suture which is a little obsolescent; no vertical fossettes. Pronotum acute-angularly emarginate posteriorly. Scutellum with three straight keels. Subcostal margin of tegmina sinuate near the base and also a little apical of the middle. Internal cell of clavus granulate.

### 1. *kalypso,* sp. nov.



(Text figure 1).

Black; head keels (anteriorly blackened), face, antennae, pronotum, sterna and legs whitish. Tegmina hyaline tinged with yellowish, subcostal vein near the base and from the stigma apically, radial vein and its forkings, stigma, apex antero-obliquely, claval vein apically &c., smoky often a little suffusedly. Vertex extending a little in front of eyes, lateral keels somewhat convergent anteriorly, forking about the apical margin of the eyes. Labium reaching nearly to apex of hind femora.

Length (female) 4½ mill.

Hab. Viti Levu, Rewa (Mar. M.).

### *Solonaima solonaima.*

Pl. VIII, fs. 13-15.

## *Myndus.*

*Myndus* Stal. 1862, Berlin Ent. Zeit. VI.

A North American genus, the Japanese species described by Uhler being, according to Matsumura, an *Oliarus*. The species now described is possibly not a true *Myndus,* but agrees in all apparent essentials.

### 1. *vitiensis* sp. nov.

Blackish; vertex soiled brownish-yellow, pronotum whitish; keels and lateral margins of scutellum sordid ferruginous. Tegmina sordid hyaline, basal veins pale, subcostal vein and apical third with veins dark fuscous suffusedly, and with 2 curved dark fuscous streaks. Sterna and legs sordid brownish yellow. Abdomen blackish brown. Vertex with lateral margins slightly converging apically, extending a little in front of the eyes. Frons as broad as long, lateral margins strongly reflexed.

Length (female) 3⅞ mill.

Hab. Viti Levu, Navua (Feb., M.).

### *Leirioessa* gen. nov.

Apparently allied to *Brixia*, but the vertex is broader than an eye and well produced anteriorly. Antennae not exserted, second segment globular. Pronotum of very different structure. Tegmina apically rounded, distinctly widening towards the apex. Hind tibiae with 3 larger and sometimes one or two smaller spines. Type *tortricomorpha*.

### 1. *tortricomorpha* sp. nov.

Pl. XXVII, figs. 9-21.

Fusco-testaceous, irregularly suffused with fuscous. Disk of scutellum tinged with ferruginous, a pale line down the middle, darker fuscous outside the lateral keels. Ocelli ruby-red. Tegmina subhyaline, veins pale with dark granules and an ashy fuscous band, etc., as in the figure.

Length of body, 4½ mill; expanse of tegmina nearly 11 mill.

Hab. Queensland, Cairns (Aug.), Kuranda (Aug.)

### 2. *vitiensis* sp. nov.

Differs from the above by the more elongate and differently patterned tegmina.

Head, pronotum and scutellum sordid piceofuscous, underside and antennae pale, 3rd ocellus rubid. Fore and middle femora fuscopiceous (except the extreme apex and base), tibiae of the same suffused with fuscopiceous. Tegmina hyaline tinged with cinereous, veins cinereous whitish, basal half with blackish-brown granules, apical half not granulate (except a few inwardly); two or three blackish-brown markings near the base and a transverse band across the corium a little basal of the middle. Wings milky hyaline, veins pallid. Labium reaches well beyond hind coxae.

Length 5¾ mill.

Hab. Viti Levu, (Mar., Muir's No. 142), on a native tree in the bush.

## *Leptochlamys* gen. nov.

Somewhat allied to *Calamister*, but the head is different and the tegmina are strongly compressed.

Vertex transverse, scarcely extending so far as the anterior margin of the eyes, part of the frons visible dorsally. Head laterally strongly carinate (a little foliaceously on the frons), frons and clypeus strongly keeled medianly, vertex strongly keeled anteriorly transversely, and there is a transverse keel between this and the base but no longitudinal keel. Antennae very short. Ocelli present. Pronotum deeply emarginate posteriorly. Scutellum with 3 keels.

### *compressa* sp. nov.

Pl. VIII, figs. 1-2.

Brownish testaceous, a little browner on the scutellum. Beneath testaceous. Tegmina subhyaline testaceous, veins mostly concolorous (except the darker marginal), feebly granulate, apex of subcostal cell and adjacent apical cells, interoapical (rounded) angle, etc., smoky.

Length 4⅞-5 mill.

Hab. Queensland, Cairns (July), Kuranda (Aug.)

## *Dystheatias* gen. nov.

Allied to *Leptochlamys* but the vertex is only slightly transverse and extends beyond the eyes anteriorly; there is only one cross keel between vertex and frons. Vertex truncate behind, the pronotum almost rectangularly emarginate, nearly touching base of vertex. Frons apically angularly emarginate, 3rd ocellus absent. Tegminal veins strongly granulate, the granules piliferous.

### 1. *beecheyi* sp. nov.

Pale testaceous; face (and scutellum except the keels and the apical fourth) irregularly suffused with pale purplish-brown, and four lateral spots at union of frons and vertex. Posterior angle of scutellum whitish. Tegmina hyaline milky, veins whitish with pale hairs, the cross-veins on apical half suffusedly fuscous; tegmina strongly and prominently granulate with dark fuscous, an oblique dark fuscous band on apical half and several short irregular markings; apical veins subsuffused. Legs pale, with brown annulations.

*Female*: abdomen short, tegmina extending about as far beyond the abdomen as the length of the hopper.

Var. *fuscata,* nov.

Like the type, but scutellum not suffused with fuscous; tegmina much darker and suffused all over with fuscous.

Length 5½ mill.

Hab. Viti Levu, Rewa (Mar., Muir).

Named after Captain William Beechey who voyaged in the Pacific in the "Blossom."

### *Australoma* gen. nov.

Somewhat like *Kinnara* (which is a Cixiine, not an Achilid), but there is no third ocellus, the pronotum is more deeply emarginate, and the scutellum, much longer; the venation different, etc. Vertex nearly square, margins elevated, disk greatly depressed, basal margin slightly emarginate. Frons shaped much as in *Kinnara*, but a little wider basally. Tegmina vertical. Hind tibiae spineless.

### 1. *austrina* sp. nov.

Pl. VIII, figs. 16-18.

Testaceous, tinged with ferruginous, paler beneath. Ocelli ruby-red. Tegmina hyaline, veins pale with brown granules, a few dark marks near the edge of the tegmen, as shown in the figure.

Length 5 mill.

Hab. Queensland, Kuranda (Aug.)

### *Quirosia* gen. nov.

Allied to *Australoma* but the vertex is much smaller and narrower, anteriorly is angular, and has two small pit-like depressions anteriorly, base truncate. Frons as in *Dystheatias*. Tegminal venation not importantly different from that of *Australoma*.

Named in honor of P. F. de Quiros, voyager in the Pacific.

#### 1. *vitiensis* sp. nov.

Sordid testaceous. Tegmina hyaline, tinged with sordid yellowish, veins and stigma paler, granules on anal vein dark. Wings hyaline, veins fuscous.

Length 5 mill.

Hab. Viti Levu, Rewa (Mar., M.).

### *Nesochlamys* gen. nov.

Differs from *Gelastocephalus* by the quite different head and by the not so strongly compressed tegmina. Frons acutely carinate medianly.

#### 1. *vitiensis* sp. nov.

Fuscous, the head keels yellowish. Clypeus, labium and legs whitish. Pronotum and scutellum dark fuscous, the hind angle of the latter minutely white. Clavus yellowish-brown, the apex fuscous, rest of tegmen dark fuscous or blackish except a semi-circular spot near the apex, from the subcostal margin to the middle of the tegmen. Abdomen mostly dark fuscous.

Length 3¾-4½ mill.

Hab. Viti Levu, Rewa (Mar. Apr. Nov., M.), Navua (Feb., M.).

The following have also been described from Australia:

*Brixia migratoria* Distant 1907 A. M. N. H., (7) XIX, 279. Queensland.

*Cixius merula* Distant, op. cit., 284. Queensland.

## *Achilini.*

As stated elsewhere, I regard *Kinnara* as a Cixiine; *Vekunta* is certainly an Issine and has nothing to do with Achilini.

Mr. Muir has collected 2 genera and 8 species in Fiji.

The following table will separate the Australo-Fijian genera:

1 Pronotum produced apically as far as the apical margin of the eyes; subcostal cell dilated; length 11 mill. . 14 *Ancipo*

1a Pronotum not produced apically nearly as far as the apical margin of the eyes; subcostal cell not dilated; length not over 7 mill. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . (2)

2 Frons strongly impressed transversely; not (or very obsolescently) carinate; an opaque white band on the face. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 13 *Aristyllis*

2a Frons not transversely impressed; more or less strongly carinate medianly ..................................(3)
3 Lateral keels of frons meeting at its base and forming an angle there. ......................................(4)
3a Lateral keels of frons not meeting directly at its base, which is more or less widely truncate (or slightly produced laterally ........................................ (5)
4 Vertex not longer than the eyes; genae foliaceous; eyes not nearly touching the lateral margins........**12 *Majella***
4a Vertex longer than the eyes, genae not foliaceous; eyes practically touching lateral margins.......**11 *Callichlamys***
5 Vertex longitudinally impressed, with a further circular impression in the middle...................**10 *Francesca***
5a Vertex often longitudinally impressed (entirely, or between the keels) but not further impressed circularly........(6)
6 Two opaque white bands across the face..............(7)
6a Face not banded..................................(8)
7 Vertex not carinate medianly, very transverse, apical margin not nearly touching apical margin of head dorsally and not connected therewith by keels........**9 *Pyrrhyllis***
7a Vertex carinate medianly, not transvere, apex touching the apical margin of the head dorsally...........**8 *Benella***
8 Vertex transverse. ..........................**7 *Achilus***
8a Vertex not transverse..............................(9)
9 3 to 4 middle apical cells of tegmina distinctly longer than wide. ......................................... (10)
9a 3 to 4 middle apical cells of tegmina not (or scarcely) longer than wide ..........................**6 *Salemina***
10 Frons basally slightly angularly produced laterally...... ......................................... **5 *Argeleusa***
10a Frons basally truncate (or if very slightly produced angulately at the sides, then also similarly in the middle)..(11)
11 Vertex very lightly impressed longitudinally on each side of the middle keel, which is strong.................(12)
11a Vertex deeply impressed longitudinally, not (or feebly) keeled. ...............................**4 *Callinesia***
12 Lateral keels of vertex anterolaterally obtuse angled..... ......................................... **3 *Eurynomeus***
12a Lateral keels of vertex meeting anteriorly acutely or roundly-acutely. ................................ (13)
13 Apical cells of tegmina distinctly declivous, tegminal veins granulate. ...............................**2 *Cythna***

13a Apical cells not (or very slightly) declivous, tegminal veins not granulate. ............................... 1 *Phenelia*

### *Phenelia.*

Mr. Muir has collected two species which I place provisionally here. *Phenelia* seems to form two subgenera:

1 Vertical keels very strong, intracarinal areas very narrow; lateral keels of vertex meeting acutely.................. ...................(a) *Phenelia* sens. str., type *elidipteroides*

1a Vertical keels feebler, intracarinal areas wide; lateral keels meeting roundly-acutely anteriorly. (b) *Nephelia*, type *bicuneata*.

The two species of *Nephelia*, are easily separable by the colour:

1 Tegminal veins pallid.......................... 2 *bicuneata*

1a Tegminal veins blackish.......................... 3 *tristis*

#### 2. *bicuneata* sp. nov.

*Male*. Brownish-yellow, abdomen and body beneath paler. Tegmina yellowish hyaline with 2 subopaque yellowish wedges, very narrowly bordered with fuscous, near the apex of the subcostal cell and a blackish-brown speck in the second apical cell; veins pale except the stem and inner fork of the radial vein, the claval veins, &c., which are yellowish-brown. Vertex about 2½ times as long as the pronotum, produced before the eyes.

Length 3⅞ mill.

Hab. Viti Levu, Rewa (Mar., M.).

#### 3. *tristis*, sp. nov.

*Male*: form of the last, but the vertex shorter, scarcely produced in front of the eyes. Pitchy, paler below. Tegmina dark smoky, with 2 black-bordered white wedges near the apex of the subcostal cell.

Length 3⅛ mill.

Hab. Viti Levu, Rewa (Apr., M.).

### *Eurynomeus.*

This may possibly be the genus *Tangina*, but the frons is laterally sinuate and the radial vein is forked apically. I am inclined to think Melichar's figures faulty.

#### 1. *australiae.*

Pl. IX, figs. 7-8.

## *Callinesia* gen. nov.

This genus is very close to ***Phenelia*** and ***Eurynomeus*,** but is distinguished by the structure of the vertex as stated in the analytical table of the Achiline genera. A black spot always present on the mesopleura. Type ***pulchra*.** The four species—all from Fiji—are separable thus:

1 Clavus and corium bright red striped with yellow. . 1 ***pulchra***
1a No bright red stripes on the tegmen..................(2)
2 Clavus and corium yellowish with pale brownish stripes; clypeus pale......................................(3)
2a Clavus and corium greenish yellow with silver-grey or brownish stripes; clypeus black .................2 ***ornata***
3 Clavus and corium yellow with broad pale fawn bands..... ..........................................3 ***venusta***
3a Clavus and corium yellowish with narrow orange brown lines ..................................... 4 ***pusilla***

### 1. *pulchra* sp. nov.

Pl. IX, fig. 17.

Yellow, legs and beneath paler; junction of vertex and frons with a black horseshoe, a black dot on the vertex laterally. Eyes black. Pronotum with a sanguineous spot anteriorly. Scutellum with an angulate sanguineous stripe which passes over on to the base of the tegmina, which are sanguineous with the following bright yellow marks: a broad basal stripe, running from the middle of the basal margin to the subcostal margin; an elongate straight spot from commissure (at posterior angle of scutellum) half way across the tegmen; an oblique entire median stripe runing subparallel to the basal margin, and 3 lateral or sublateral spots apical of that, the apical one at least being margined interiorly with fuscous. Apical and subapical cells hyaline (some of the outer ones suffsued sanguineously) with sanguineous veins. Vertex deeply impressed, middle keel obsolescent. Labium reaching to middle coxae.

Length 4½ mill.

Hab. Viti Levu, Rewa (Mar.-Apr.).

### 2. *ornata* sp. nov.

Fulvescent or yellowish testaceous, the head marked as in *C. pulchra*. Eyes and clypeus black. Posterior two-thirds of scutellum intracarinally black (or silvery grey.) Tegmina fulvescent or yellowish, with fulvous veins, an oblque silvery grey (or brownish) oblique band near the base and a large spot of the same colour near the middle exteriorly. Apical cells smoky silvery. Wings parly smoky, partly margined very narrowly with canguineous, veins smoky. Sternites black, pleurites margined with sanguineous. Head as in *C. pulchra.*

Length 4½-4⅞ mill.

Hab. Viti Levu, Rewa (Mar.-Apr., Muir).

### 3. *venusta* sp. nov.

Ivory coloured, vertex with a tiny black streak on each side of the middle keel anteriorly and a black speck on the gena close to the eye. Eyes reddish or pinkish. Pronotum with one and scutellum with 3, orange brown spots on each side of the middle keel. Tegmina with two more or less well formed pale fawn transverse bands and one or two lines; one or two blackish lines on and beyond the subcostal cell apically. Wings hyaline, veins blood-red. Vertex a little less deeply impressed than in the preceding, middle keel clearer.

Length 4-4½ mill.

Hab. Viti Levu, Rewa (Mar., Muir).

### 4. *pusilla* sp. nov.

Orange testaceous, paler beneath; vertex with a black V anteriorly, and 3 black specks on the gena. Eyes red. Pronotum with an orange-brown spot on each side; scutellum with 2 interrupted narrow transverse orange-brown lines. Basal half of tegmen pale yellow with a transverse hyaline band and about five undulating orange-brown transverse lines. Apical half of tegmen smoky hyaline, veins whitish, some a little tinged with blood-red. Subcostal cell basally yellow, apically hyaline with 2 yellow wedges, basally bordered with black very narrowly. Wings hyaline, veins very pale sanguineous. Head as in *C. pulchra.*

Length 4 mill.

Hab. Viti Levu, Rewa (Mar., Muir).

## *Francesca.*

*Francesca salemninophila* is now figured. (Pl. VII, figs. 18-19.)

## *Callichlamys* gen. nov.

Apparently allied to *Cnidus* by the elongate-oval eyes; h[illegible]as somewhat the appearance of *Pseudohelicoptera*.

Vertex narrowing gently towards the rounded apex, flatten[illegible]d along the entire length and medianly carniate. Eyes elonga[illegible]te oval, not as long as the vertex and decumbent on the pronotu[illegible]m Frons sinuate laterally, medianly carinate; clypeus small, la[illegible]bium reaching to about the base of the middle coxae. Pron[illegible]otum anteriorly subtruncate, posteriorly angularly emarginat[illegible]e. Pronotum and scutellum tricarinate. The radial vein forks [illegible] a trifle nearer to the base than the brachial; subapical cells pr[illegible]esent; apical cells elongate. Hind femora with a small spine.

There are two species:

1 Vertex more than twice as long as an eye.........1 *muir[illegible]ri*.
1a Vertex scarcely longer than an eye............2 *undula[illegible]ta*

### 1. *muiri* sp, nov.

Pl. IX, fig. 20.

Sordid whitish, vertex with 2 subcontiguous dark fuscous lin[illegible]es on the apical half, clypeus fuscate. Pronotum and scutellum ro[illegible]sily suffused discally. Tegmina hyaline, tinged with yellow, su[illegible]ffused with sanguineous especially on the subcostal and radic[illegible]al cells and clavus, also on the apical half of the apical cells; vei[illegible]s sanguineous; the nodal veins fuscous, the basal one border[illegible]d with yellow and a dark fuscous spot at the base of the secon[illegible]d apical cell.

Length 4⅞-5½ mill.

Hab. Viti Levu, Rewa (Mar.-Apr., Muir's No. 204).

### 2. *undulata* sp. nov.

*Male*: head, pronotum and scutellum pale yellow; 2 subcontiguous blackish elongate narrow spots (sometimes merging) close to apex of vertex; clypeus brownish; 2 brown spots on pronotum; 4 brown spots (2 in a row each side of middle line) on scutellum between lateral keels, scutellum laterally brownish. Tegmina whitish, very narrowly margined at least apically with dark sanguineous, with about 4 oblique, partly a little obscure, interrupted, brown rows of stripes; subcostal cell with 2 yellow wedges near the apex, margined with brown. Apical cells

:y, veins partly pale. Legs mostly yellowish-white. Ster- black.

ngth 4 mill.

ıb. Viti Levu, Rewa (Mar., M.).

### *Aristyllis.*

e following species are now figured:

*aristyllis*, Pl. IX, figs. 3-4.

*omphale*, Pl. IX, figs. 1-2.

*adippe*, Pl. IX, figs. 5-6 (the type is a little immature, con- :ntly the frontal structure is a little obscure.

### *Aneipo.*

*:eipo* Kirkaldy.

*Tudea* Distant op. c., 290.

### 1. *diva.*

*diva* Kirkaldy.

*T. picturata* Distant, l. c.

e following have been described as Achilinae:

*ıhuna conspersa* Distant 1907, op. c., 290 Queensland.

*wea doddi* Dist., op. c., 292, do.

*laloa pallescens* Dist., op. c., 295, do.

### *Dictyophorini.*

stant has recently described the following:

*:tyophara* (sic!) *prognatha* 1906 A. M. N. H. (7) XVIII, 352, :nsland. He also (probably incorrectly) confirms a species 'alker's in the same genus, viz:

*concolor* Walker 1851 List 322; Distant l. c., North Aus- :, Queensland and South Australia.

stant, following Stal, incorrectly places *Leusaba* in the iduchinae; the absence of a well developed costal vein, :ver, and the running of the anal vein into the commissure basal of the apex of the clavus, places this genus in the ʼophorinae. The genus *Augila* placed by Stal and Distant e Issinae, certainly has no place there; it probably belongs e Dictyophorinae.

the A. M. N. H. (7), XIX, 415, Distant boldly synonymizes *atodictya lucindae* Kirk. with *Dictyophora bifasciata* Dist., and

*T. anadyomene* Kirk. with *D. insignis* Dist., but he rather unfairly omits to mention that the likelihood of these synonyms was indicated by me at the same time. I thing the latter pair are likely to be united, though they could not be from Distant's description. In the case of the former, *D. bifasciata* is said to have ochraceous sternites, while in *T. lucindae,* they are almost black, in both sexes and in a good series. For the present, therefore, I decline to accept Distant's synonym. In any case, the reference of these forms to the genus *Dictyophora* (or *Dictyophara* as Distant incorrectly cites it) is absurd.

### Fulgorinae.

### *Eurystheus perkinsi.*

This species was taken on a species of *Casuarina.*

### *Eurinopsyche.*

I unfortunately said (p. 389) that the tegmina are decumbent: on the contrary they are scarcely tectiform, it is the tegmina in *Eurystheus* that are subdecumbent. *E. obscurata* was taken from "Queensland native plum."

Three new species have since been described from Australia by Distant, who has indeed included them in *Eurystheus,* but as he compares them with *E. dilatata,* it is to be presumed they belong to *Eurinopsyche.*

2. *doddi* Distant 1903 A. M. N. H. (7) XVIII, 19 (Queensland.)
3. *clementi* l. c. (West Australia.)
4. *pallescens* op. c., 20 (West Australia.)

Distant has also (26-9) described from Australia two supposedly new genera with three species, viz:

1. *Galela parva* (West Australia.)
2. *G. abdominalis* (Colony not stated.)
3. *Erilla turneri* (Queensland.)

N. B. *Desudaba maculata* and the other species in Distant's paper cited (390 etc.), were published 1893 (Jan.), not 1892 (Dec.).

On Pl. VII, figs. 7-8, a nymph of a Fulgorine is figured. The adult is unknown. In fig. 8 the sublateral keels are shown a little too strongly and the anterior sensory organs have been omitted.

## Asiracidae.

The most obvious character of this family is the *mobile* spur at the base of the hind tibiae. Its most primitive form is probably seen in *Ugyops, Asiraca,* &c., in which it is awlshaped, the margins not serrate or dentate. There are two further types, as mentioned further on.

The Asiracidae probably—almost certainly—are derived from Cixiinae, but the mobile spur and the nature of the antennal sensory organs necessitate the maintenance of a special family for them.

## Head.

In all known Asiracid nymphs, the frons has two keels down the middle, and the entire head is studded with sensory pustules. In the adult *Achorotile,* both these characters obtain, and this genus is therefore reasonably considered to be the most primitive known Asiracid. The first step of importance in the development of the family is in the fusion, almost wholly or in part, of the median keels of the frons; in some forms, they are completely fused almost to the connecting keels, in others, only as far back as the apical margin of the eyes. *Laccocara* has the nymphal pustules, but has partially fused frontal keels. These are the only two Asiracid genera known to me which have punctured pustules in the adults. Of other head characters, the most obvious is the form of the antennae; in the majority of forms, the first segment is short and cylindrical or annuliform, the segment being subcylindrical and not, or not noticeably, furished with sensory organs; in others they are varyingly flattened and dilated, elongate, and so forth.

The clypeus is sometimes carinate, sometimes not. The genal keel sometimes meets the frontal keel acutely at the apical margin, sometimes does not meet it. In one form, *Paranda,* the vertex is smoothly rounded in front, not (or feebly) carinate, and this must perhaps be regarded as a more or less degraded form.

## Thorax.

Great stress has been placed on the lateral keels of the pronotum, two categories being supposed, viz.:

1. Lateral keels straight, meeting the hind margin,
2. Lateral keels curved, not meeting the hind margin.

Very often however the keels fork *near* the hind margin, one fork reaching the hind margin while the other curves outwards. The scutellum of the mesonotum may be 1, 3, 4 or 5 keeled; this is useful for generic separation.

## Venation.

The venation is of comparatively little importance, as it is often very variable, especially in the apical cells. The brachial and radial are nearly always forked near the subapical line. The median vein continues direct to the apical margin of the tegmen in *Asiraca, Conomelus, Criomorphus, Tropidocephala* and *Metropis,* but ends at the subapical line in *Jassidaeus, Delphacodes* and its allies. The wings have (generally in the long-winged forms at least) a small stridulatory area. (See "Introduction.")

## Legs.

The legs afford good characters.

In *Asiraca*, and *Phyllodinus*, the fore pair are dilated, in other genera, however, they are cylindric.

A good character is afforded by the mobile spur of the hind tibiae, which has not up to the present been fully utilized. There are three principal forms:

(1) probably the original, in which it is simple, awl-shaped, not provided with a fringe of teeth, but only one apical tooth. This occurs in *Asiraca, Melanesia and Ugyops.*

(2) the usual form; large, bilaminate, with a row of many, very feeble, minute teeth: the species are probable grass-feeders.

(3) solid, subcultrate, elongate, narrow and strongly compressed, with a row of a few, large, strong teeth. This form is that of all the endemic Hawaiian species, but otherwise only known to me in *Proterosydne*, an Australian genus.

As the Hawaiian forms are all arboreal, this may be the characteristic spur of arboreal species.

## Genitalia.

The genitalia in the male are the final test of a species and even afford generic criteria.

## (a) Male genital segments.

The terminal segment in the male is in the form of a chitinous cylinder, whose profile often affords good specific characters; this is the pygophor. On looking at this from behind, it is seen to be divided into two parts, a smaller dorsal cavity, the anal tube; and a larger ventral one, the genital tube.

The anal tube contains the mobile anal style,* while the genital tube contains the following: .

(1) the mobile genital styles which are articulated near the ventral margin, being situated more or less horizontally on looking into the tube.

(2) the oedeagus, which is situated about the middle of the pygophor and is more or less vertical on looking into the tube, so that the pygophor must be tilted to observe the former properly. It is perforated by the muscular, protrusible, penis;

(3) the lateral margins of the pygophor are often thickened and dilated and also interiorly produced into hooks or spines. There are also hooks or spines close to, or proceeding from, the wall between the anal tube and the genital tube, and also on the posterior margin of the pygophor.

The following is a partial synonymy of the parts:

1 Pygophor=Pygofer Edwards=*Aftertraeger* Fieber=*Vulvar appendix* Signoret=*Hypopygium* Kolenati.

2 Anal Tube=*Anterior part of the segment* Sharp=*Afterrohr* Melichar..

3 Anal Style=*Rectal cauda* Sharp=*Afterstielchen* Fieber. This is the termination of the alimentary canal.

4 Diaphragm=*The transverse deflected wall separating the anal tube from the genital tube* (Sharp).

5 Oedeagus=*Porte penis* Fieber=*Penistrager* Melichar. This is the "part of the male organs through which pass the membranous structures connected with the ejaculatory duct."

6 Genital Styles=*Lateral accessory pieces* Sharp=*Styli* and *Griffel* Fieber=*Cerci* of some authors.

7 Ventral Margin of Pygophor=*Posterior edge of segment*=*Lip* Sharp.

The various hooks are not specially named.

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* This has sometimes been omitted in the drawings.

In almost all the species hereafter described, the male pygophor is briefly described, but the figures should also be referred to. In connection with both descriptions and figures, it must be remembered that the pygophor is not always, or even often, straightly truncate apically, that the different pieces do not necessarily lie in the same plane, and, moreover, that they are partly mobile. Consequently when comparing with suspected specimens, the latter should be carefully examined from several points of view. The figures have almost all been drawn when the genital styles, usually the most important part, are as flat to the eye, as possible.

(b) Female Genitalia.

I have not specially studied these, and have not used them in the descriptions, but they appear to present slight specific differences in the lengths of the segments.

The Australo-Fijian Genera may be disposed as follows:

1 Tibial spur awl-shaped, with concave sides, and one (apical) spine .......................................... (2)
1a Tibial spur bilaminate, or at least tectiform, with several feeble spines on the lower edge ....................(3)
1b Tibial spur subcultrate, solid, elongate, strongly compressed with 8 strong spines................3 *Proterosydne*
2 Antennae very long, second segment one half longer than the first, frontal keels uniting about the middle of the frons .................................. 1 *Ugyops*
2a Antennae shorter, with the second segment 3 times longer than the first, frontal keels uniting close to the base of the frons .............................2 *Melanesia*
3 Antennae cylindric: male pygophor not spined on the ventral margin .............................. (4)
3a First segment of antennae flattened and much widened apically; male pygophor with 2 spines on the ventral margin .................................. 7 *Perkinsiella*
4 Frons with 2 outwardly rounded keels, uniting at base and apex (if at all).......................4 *Criomorphus*
4a Frons with 2 keels uniting not apical of the lower margin of the eyes ..................................(5)
5 Head dorsally at least twice as long as wide.........(6)
5a Head dorsally less than twice as long as wide.........(8)
6 Hind margin of head sinuate .............8 *Stenocranus*
6a Hind margin of head truncate ....................(7)

7 No connecting (transverse or oblique) keels on vertex.... .................................. 10 *Tropidocephala*

7a Transverse or oblique submedian keels on the vertex.... .................................. 9 *Hadeodelphax*

8 Frontal keels uniting apical of one-fourth of the length of the eyes frontally ................................ (9)

8a Frontal keels uniting not apical of that.............. (11)

9 Head rounded anteriorly, keels on frons very feeble.... .................................. 11 *Anectopia*

9a Head with strong keels ......................... (10)

10 Lateral keels of pronotum straight, or curving very slightly inwards, reaching the posterior-margin; male pygophor without spines on the ventral wall of the anal tube.... .................................. 5 *Peregrinus*

10a Lateral keels curving outwards under the eyes; male pygophor with spines on the ventral wall of the anal tube .................................. 6 *Dicranotropis*

11 Lateral margin of vertex roundly arched, not carinate, meeting anteriorly roundedly, the central dorsal area long triangular, strongly keeled ...........12 *Haplodelphax*

11a Lateral margins of vertex more or less straight and keeled .................................. (12)

12 Male pygophor with the ventral margin deeply emarginate 3 or 4 times.........................15 *Megamelus*

12a Male pygophor not emarginate on the ventral margin more than once ..............................13 *Gelastodelphax*, 14 *Smicrotatodelphax* and 16 *Delphacodes*

## *Ugyops.*

*Ugyops* Guerin 1834 Voy. Belanger Zool. IV 477.

This genus is distributed over the Oriental Region and one species was described from Ponape in the Carolines; a new species is now added from Fiji.

### 1. *vitiensis*, sp. nov.

Pale sordid stramineous, suffused in places with a rosy hue, apical half of second segment of antennae infuscate. Keels of head and scutellum very narrowly dark. Pronotum discally fuscous. Tegmina hyaline, tinged with a smoky hue in parts, subcostal vein pale, other veins dark fuscous, occasionally annulate with yellowish white; apical cells sparsely fuscous in parts, especially apically; claval veins irregularly suffused. Wing hyaline, veins blackish brown, apical margin fuscate. Tergites marked with fuscous. Vertex deeply emarginate, the truncate base being apical of the middle of the eyes (dorsally). Frons much as in Stal's figure of *U. kinbergi*, but the central keels are not so prominent basally and are less distant; the lateral margins are more evenly rounded towards the clypeus which is clearly sutured off from the frons. Second segment of antennae one-half longer than the first. Labium long, reaching to about the hind coxae. Tibial spur awl-shaped with 3 hollow sides, only one (an apical) spine.

*Female*: pygophor pale yellowish; ovipositor apically fuscous, about as long as the nota and the rest of the abdomen.

Length 9¾ mill.

Hab. Viti Levu (No. 133 Muir Mar. '06) arboreal.

## *Melanesia*, gen. nov.

Head dorsally a little longer than wide, vertex transverse, irregularly shaped, with two fairly deep but obscurely defined foveae; frons about twice and a half as long as wide, apically and basally truncate, a single filiform keel forking close to the base, lateral margins widening a little towards the apex but narrowing slightly at the apical margin. Genae not carinate. Labium reaching beyond the fore coxae. Antennae long and reaching to about the middle of the clypeus, somewhat flattened with few circular sensory organs, but many short bristles; second segment three times as long as the first; which is rather wider apically than basally. Pronotum very transverse, lateral keels curving under the eyes. Scutellum four times as long as the pronotum, with 5 keels. Tegmina with the radial vein forking much closer to the base than the brachial, reforked basal of the subapical transverse line; somewhat apical of the middle, the tegmina are bent in and there is a cross vein which cuts across the longitudinal ones, turning off obliquely towards the apex about the middle and turning off again, close to the apex of the clavus, into the commissure. Tegmina closely and finely granulated both on and between the shortly piliferous veins; there are 10 apical veins, 4th and 5th reforking, 7, 8, and 9 having a common base. Hind tibiae longer than the tarsi, with a basal spine and another basal of the middle; spur much as in *Ugyops*: basal segment of hind tarsi much longer than the other two together.

### 1. *pacifica,* sp. nov.

Pl. XVII, figs. 13-14.

Vertex, pronotum and scutellum yellowish fuscous, keels a little darker: face yellowish, lateral keels very narrowly blackish-brown; antennae, labium legs, sterna, &c., brownish-yellow, the fore and middle tibiae obscurely biannulate with fuscous; apices of first and second segments of hind tarsi, more or less dark. Tegmina brownish-yellow, a small dark spot about the middle of the clavus; apical margin dark and often the subcostal also.

*Male*: sternites more or less ferruginous; last segment deeply rotundately emarginate; pygophor elongate, very sinuate in profile; anal tube elongately produced in a horizontal direction. Genital styles contiguous inwardly for a third of their length, then curving outwards and recurving, apices acute, nearly contiguous. The entire male pygophor is very peculiar and very difficult to describe, but the figures show clearly the salient characters.

*Female*: sternites yellowish-brown, sutured with black, few last segments deeply acute-angularly emarginate, ovipositor dark, much longer than pygophor.

### Var. *strigata* nov.

*Female*: a broad blackish-brown stripe down the tegmen from base to apex, slightly outside the middle.

Length 6¼-6½ mill.

Hab. Fiji (March, Muir's Nos. 111, 114 and 145), Navua (Feb. M), Rewa (March M), arboreal.

## *Purohita* Distant.

1906 Faun. Ind., Rh. III, 465 & 470.

This genus must be placed in the neighborhood of *Asiraca* on account of the structure of the antennae and tibial spur, though the latter shows some alliance with *Perkinsiella* &c. The hopper has a close superficial resemblance to *Oliarus*.

### 1. *arundinacea* Distant.

1907 E. M. M., XLIII, 10.

I am obliged to Messrs. Mann and Antrim for specimens of this pretty little hopper. Beyond the greater length of the second segment of the antennae, it differs from *P. cervina* by the radial and brachial veins of the tegmen being forked at about the same distance from its base, while in *P. cervina* the radial is forked much nearer the base. I still further supplement Distant's superficial descriptions by figures of the male genitalia: male pygophor of irregular shape, very deeply and elongately emarginate ventrally; the anal tube forms a kind of hood, covering over the genital styes, which are acutely elongate. (Pl. XV, figs. 6-8).

### *Proterosydyne*, gen. nov.

Distinguished by the absence of connecting keels on the vertex, the very large eyes, and the peculiar tibial spur.

Vertex subtriangular (the anterior and posterior halves of the lateral margins very obtuse angled, so that, although the vertex is really 5-hedral, it may be said to be triangular), with no median or connecting keels; lateral keels not quite contiguous apically, almost enclosing an elongate exceedingly narrow space before uniting about the apical margin (frontally) of the eyes. Between the apex of the vertex and this forking, the head is highly polished and the keels rather obscure, otherwise the keels are all well marked. The median keel reaches the apical margin of the frons, which is a little emarginate roundedly. Vertex deeply concave, about as long as wide and does not extend as far anteriorly as the yes, thus displaying a rounded frontal margin. Frons rather narrow, elongate, subparallelsided, slightly rounded exteriorly. Middle keel of genae meets lateral margins of frons at an acute angle at the apical margin of the frons; the clypeus rather feebly tricarinate. Head not decumbent on the pronotum anterolaterally. Eyes very large, about as wide as vertex, longer than wide. Antennae subcylindric, long, reaching almost to apex of clypeus, second segment scarcely more than twice as long as the first, a little wider apically than basally, flagellum much longer than peduncle. Pronotum longer than vertex, narrower apically than the vertex basally, strongly tricarinate, lateral keels straight, reaching posterior margin, not contiguous anteriorly; posterior margin slightly, obtuse-angularly, emarginate posteriorly. Scutellum with anterior three-fourths of disk roundly convex and polished, posterior fourth flat, rather obscurely tricarinate, middle keel not reaching the flat part. Tegmina (brachypterous form only known) granulate, reaching be-ond apical margin of last pleurite. Wings rudimentary, reach- g very little beyond base of metanotum. Hind tibiae with spines (1 basal), nearly one-half longer than tarsi; spur solid, longate, narrow, with 8 spines. First segment of hind tarsi nger than the others together.

### 1. *arborea* sp. nov.

Pl. XVIII, figs. 11-12.

Basal part of vertex, the clypeus, pronotum, scutellum antero- terally and basally, metanotum, sterna, legs, etc., pale yellow- rown. Apical part of vertex, basal two-thirds of frons, a large ound spot on disk of scutellum, polished black. Antennae pale rown, second segment more or less infuscate. Apical third of rons whitish. Tegmina hyaline, basal half tinged with yellow- h-brown, a large hyaline spot in the middle (with a short, dark, ransverse stripe at base), which, when the tegmina are closed, iscloses the tiny, opaque white wings. Tergites blackish, basally eddish testaceous, apically with a pale yellow-brown, elongate edge; apical margin of last three tergites sanguineous.

*Female*: sternites pale brown, ovipositor blackish. Last tergite onger than the preceeding segment, apically roundly produced.

Length 2½ mill.

Hab. Queensland, (Koebele 2302).

Only a single female, unfortunately, of this very distinct form.

## *Criomorphus.*

*Criomorphus Curtis* 1833 Ent. Mag I, 195.

*Stiroma* Fieber 1866 Verh. Zool. bot. Ges. Wien XVI ?=subgen.)

*Ditropis* Kirschbaum 1868 Jahrb. Nass. Ver. Nat. XXI-XXII. . 11.

*Eurybregma* Scott 1875 E. M. M. XII, 92.

A somewhat heterogeneous assemblage, some of the forms of hich seem not far from being directly in the line of descent of *icranotropis.* The pygophor is destitute of spines or hooks n the ventral margin.

### 1. *australiae* sp. nov.

Differs from most of the other species included in *Criomor- hus* by the frontal keels being separated, though close together, during their entire length; the antennae reach beyond the base of the clypeus. Dark fuscous or pitchy, frons and legs a little paler, the former with 5 or 6 tiny paler spots on each side; clypeal keels and lateral keels of frons, antennae, markings on legs, &c., brownish testaceous. Tegmina hyaline.

*Male*: pygophor pitchy.

Length 3¼ mill.

Hab. Queensland, Brisbane (Nov., P.).

## *Peregrinus.*

*Peregrinus* Kirkaldy 1904 Entom. XXXVII, 175 and 1906 Bull. H. S. P. A. Ent. I, 407.

=*Pundaluoya* (pt.) Distant 1906 F. B. I, III, 467.

This genus agrees with *Dicranotropis* in the forking of the front, in the antennae, in the non-contiguity of the frontal and genal keels apically, in the ocelli not nearly touching the lateral keel of the frons, but being situated close to or touching the eyes, and in the form of the tibial spur. It differs chiefly in the tegminal and alar venation in the macropterous forms, and in the lateral keels of the pronotum which practically reach the hind margin and curve inwards here rather than outwards. The second and third apical veins have a common stalk, the latter being re-forked. The pygophor has no spines or hooks on the ventral margin in the males, nor on the ventral wall of the anal tube.

### 1. *maidis.*

Pl. XII, figs. 7-8 & Pl. X, f. 14.

This has further been recorded from the Antilles by Ballou, from Ceylon (under the names of *Liburnia psylloides* and *Pundaluoya simplicia*) by Distant, and Mr. Muir has taken it from grass in Fiji, Rewa (Mar.-Apr.-Nov., No. 6). Mr. Van Deventer has sent it to me from Java.

## *Dicranotropis.*

In the males, the ventral margin of the pygophor is without hooks, but there are some on the ventral wall of the anal tube.

The 5 Australasio-Oriental species known to me may be disposed as follows:

### (a) Longwinged forms:

Tegmina maculate .............................. (2)
Tegmina practically immaculate .................... (3)
Tegmina strongly granulate, apically with a semicircular stripe and 2 short, straight stripes ........... 3 *koebelei*
Tegmina feebly granulate, apically with a straight stripe.. ...................................... 4 *muiri*
Apical veins dark, slightly infuscate .......... 1 *anderida*
Apical veins pale ........................ 2 *aristoxenus*

### (b) Shortwinged forms.

Tegminal veins pale, not granulate ............ 1 *anderida*
Tegminal veins with large, dark granules ............. (2)
Frons apparently concolorously fuscotestaceous, fore tibiae black ........................... (?) 5 ***nigropunctatus***
Frons blackish brown with pale yellowish specks; fore tibiae brownish black, pallidly annulate ............. 3 *koebelei*

Many of the European genera seem to be but little differen-.ted from *Criomorphus*, for ex., in the form of the frons, *Dicranropis hamata* seems much nearer to *Delphacodes* than it does *Dicranotropis beckeri.* (*)

### *anderida* sp. nov.

Differs, beyond the points already mentioned, from any other *icranotropis,* by the head keels not being bordered at all with ackish, except *D. nigropunctata* Melichar, which has dark genae id dark lateral parts to the nota, &c. Orange brown, the keels vertex and nota, and the parts exterior to the lateral keels of e nota mostly, pale yellowish testaceous. Frontal keels very irrowly bordered with pale yellowish orange, frontal specks the me colour. Antennae pale orange testaceous, apex of first segent dark fuscous. Tegmina pale yellowish hyaline, veins of sal two thirds mostly pale, of apical cells fuscous somewhat ffusedly. Frons elongate, narrower, subparallel, a little conicted basally, forked a little basal of the apical margin of the es. Tegminal veins very feebly granulate.

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* I propose a new genus for this last species, viz.: *Leimonodite*, characterized by frontal keels being separate till nearly the apical margin. From *Criomorphus* it ers by the longer and narrower frons, whose median keels are stalked apically. If s genus cannot be sustained, then *Delphacodes*, *Criomorphus*, *Dicranotropis* and eral others, must be thrown together.

*Shortwinged form*: tegmina much as in *D. hamata*, the apical cells, or at least one of them, fuscous.

*Female*: abdomen more or less infuscate laterally.

Length 2½ (brachypterous), 4⅛ (macropterous) mill.

Hab. Queensland, Cairns (Aug., P.), Redlynch (July, P.), Brisbane (June, P.); Fiji, Rewa (Muir's No. 160, Mar.-Apr.), Ba (Jan., M.), Navua (Feb., M), on grass. I have seen females only.

2. *aristoxenus*, sp. nov.

Very close to the last, but a little smaller and coloured differently.

Pale yellowish testaceous, without orange colouration and the frons not (at least noticeably) maculate.

Tegmina pale yellow hyaline, veins uniformly pale testaceous, not granulate. Lateral margins of frons very slightly more rounded laterally and more constricted basally.

Length 3½ mill.

Hab. Queensland, Cairns (Aug., P.).

I have seen females, only, of this also.

3. *D. koebelei* (Kirkaldy).

Pl. VIII, figs. 9-10 & Pl. XVII, figs. 8-9.

*Phacalastor koebelei* Kirkaldy 1906 Bull. H. S. P. A. Ent. I, 408.

Since my original description, I have seen a shortwinged female.

Dark fuscous; keels, spots on frons, second segment of antennae, intermediate and hind legs more or less, &c., yellowish testaceous. Tegmina cinereous (granulations dark fuscous), reaching to about half the length of the abdomen, apically rounded. The male pygophor is subrotundate viewed end-on, the ventral margin projecting acutely in profile.

Length 2¼ mill.

Hab. Fiji (March, K.).

4. *muiri* sp. nov.

Pl. XII, figs. 4-6.

Pale cinereo-testaceous, metanotum posteriorly yellow. Sternites blackish, laterally variegated with yellowish-brown, medianly subsanguineous. Genital segments pale. Tegmina hyaline, veins whitish; second longitudinal apical cell smoky, apices of apical veins infuscate, also a short fuscous line near apex of commissure. Keels of frons forked about the middle of the eyes.

*Male*: pygophor beneath very deeply emarginate basally. Anal tube with a strong spine on each side overlooking the genital tube. Genital style elongate reaching from end to end. The oedeagus is remarkably long and is subhorizontal.

Length 4½ mill.

Hab. China, Wei Chou (Sept.).

I have great pleasure in naming this species after its discoverer.

## *Perkinsiella.*

*Perkinsiella* Kirkaldy 1903 Entom. XXXVI, 179 and 1906 Bull. H. S. P. A. Ent. I, 404.

*Phacalastor* Kirkaldy op. c., 408. (part)

A derivative of *Dicranotropis* from which (& *Peregrinus*) it differs by the antennae being flattened and dilated, the apical margin of the first segment being much broader than the base; the genal and frontal keels meet acutely apically. The venation, and the form of the head and pronotum are similar to those of *Dicranotropis*. In the male the ventral margin of the pygophor has two hooks or spines of varying length and form, according to the species. The males of the six species known to me are easily distinguishable by the form of the pygophor, otherwise the species may be separated as follows: (*)

1 Frons with a more or less uniform ground colour, with transverse pale dots, &c. .......................... (2)
1a Frons basally brownish, apically whitish, the two areas well contrasted, the former with pale dots .............. (3)
2 Frons pale brownish, with whitish dots basally and apically .................................... 5 *vastatrix*
2a Frons piceous with brownish-yellow transverse dots, &c. .................................. 1 *pseudomaidis*
3 Males ........................................... (4)
3a Females ........................................ (7)

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* *Perkinsiella* is also closely related to the American *Stobaera*, but in the latter the head is distinctly narrower than the pronotum and the pygophor has no spines on the ventral margin in the male.

4 Scutellum laterally broadly dark brown ..............(5)
4a Scutellum concolorous ..................................(6)
5 Tegmina feebly granulate .................3 *saccharicida*
5a Tegmina strongly granulate ...................6 *sinensis*
6 Antennae shorter, granulation dark and stronger....... . . ................................ 2 *graminicida*
6a Antennae longer, granulations paler and feebler..4 *vitiensis*
7 Longwinged forms .............................. (8)
7a Shortwinged forms ................................ (9)
8 Tegmina almost immaculate, some of the apical veins lightly suffusedly infuscate ..................... 4 *vitiensis*
8a Median cell sometimes smoky, also 5th and 6th apical cells (except small hyaline spots at apex)......3 *saccharicida*
9 Antennae longer and stouter, tegminal granules comparatively feeble and paler ..................3 *saccharicida*
9a Antennae shorter and less stout, tegminal granules stronger and darker ............................2 *graminicida*

Table of known *nymphs* of the genus *Perkinsiella*.

1 Ground colour of frons darkish-brown with white marks; and a dark brown stripe across the base of the tegminal and wing pads, apex of tegminal pad dark brown...... .................................. 1 *pseudomaidis*
1a Frons dark basally with pale marks, pale apically; tegmina not striped transversely as above ..................(2)
2 A conspicuous black spot at apex of abdomen on each side; tibial spur fuscous ......................2 *graminicida*
2a No spot (or very inconspicuously) at apex of abdomen on each side; tibial spur pale ...................... (3)
3 Base of 1st segment of hind tarsi brown; clypeus blackish-brown .................................. 4 *vitiensis*
3a First segment of hind tarsi entirely pale; clypeus pale fuscous ............................ 3 *saccharicida*

The *nymph* of *sinensis* is not yet known; that of *vastatrix* has been briefly described by Breddin, but not so as to be included in the table.

## 1. *pseudomaidis.*

Pl. XII, figs. 1-3.

*Phacalastor pseudomaidis* Kirkaldy l. c.

This species tends to connect typical *Perkinsiella* with *Dicranotropis*, but still has the widened antennae. Mr. Muir has now ı it in Fiji (Mar., Muir's No. 131), on *Saccharum offici-m.* The male pygophor has two, somewhat short, ventral :s, and in profile the ventral margin is acutely produced. ıe genital styles are somewhat twisted. The ventral wall of ınal tube has 4 spines, the dorsal being longer than the ven- The contents of the pygophor have been drawn from a imen in which they were not in repose.

### 2. *graminicida.*

Pl. XII, figs. 14-15.

ıe male pygophor has two very short spines on the "lip," two long curved tusks from the ventral side of the anal tube. genital styles are apically bispinose and the oedeagus is :r small.

### 3. *saccharicida.*

Pl. VIII, figs. 5-8, Pl. XII, figs. 11-13.

·. Van Deventer has kindly sent me examples from Java. 'l. 17, fs. 1 and 4 of my former memoir, the obscure median of the scutellum was omitted.

ıe male pygophor has two broad spines, acuminate apically, he "lip," and two upward curved tusks on the ventral side ıe anal tube. The genital styles are broad and rather flat. nose apically. The oedeagus is rather long and has a trian-r process on the middle of the "back."

### 4. *vitiensis.*

Pl. XII, figs. 9-10.

ıe "lip" spines in this are slender and very long. The geni-tyles are medianly branched, as well as bispinose apically. oedeagus is long and broad. The spines on the anal tube ›ifid.

### 5. *vastatrix.*

Pl. X, figs. 12-13.

·. Van Deventer has sent me a male of this from Java, where :ver it is apparently not the commonest species, this being

*P. saccharicida.* (*) The male just mentioned agrees with Breddin's description, whereas the one sent me years ago by the latter was a *Dicranotropis*, not agreeing with his description. The females then sent by Dr. Breddin were true *vastatrix*. The spines on the "lip" are very long and broad in profile. The genital styles are very remarkable, being much branched and apparently somewhat basin-like. The oedeagus seems to emerge much nearer the anal tube than usual. The spines from the latter are triangular and rather broad basally.

## 6. *sinensis* sp. nov.

Pl. X, figs. 14-15.

*Male* (*macropterous*) : differs from *saccharicida* by the strongly granulate tegmina and the genitalia. The clypeus is mostly dark brown. The paler and darker hues are brighter and more contrasted. The pygophor has long tusklike spines on the "lip," the genital styles are curiously twisted with a crumpled spine apically, the oedeagus is not unlike that of *vitiensis*, but rather shorter. The spines on the anal tube are long and slender.

*Female* (*brachypterous*) : tegmina with pale veins strongly granulate with dark brown; a dark brown spot at the base of the apical cells in the middle and one at the apex of the clavus.

Length (male) 4⅝ (female) 3¼ mill.

Hab. China: Wei Chou (Sept., Muir).

## *Stenocranus.*

=? *Sogata* Distant 1903 Faun. Ind. Rh. III, 465 and 471 f. 258.

## 1. *agamopsyche.*

Pl. XI, figs. 1-4. and Pl. XVII, figs 6-7.

This species is nearest to *dorsalis* (Fitch). The radial vein forks nearer to the base than the brachial, and there are 8 apical cells, the 4th and 7th being pedicellate.

The male pygophor is emarginate subdorsally and the outline is sinuate. The anal tube has an acute tooth on either side-

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* See Kirkaldy "Descriptions et remarques sur quelques Homopteres..... vivant [[illegible]] sur la canne a sucre" A. S. E. Belg., L I, 123-7 (1907).

The genital styles are large and of peculiar form. The oedeagus seems to be double, or at least to have two hook-like processes.

The nymph is figured on Pl. XI, figs. 3-4.

### 2. *pacificus* sp. nov.

Pl. XV, figs. 4-5.

Pale yellow, a broad whitish median line down the middle from head anteriorly to hind margin of scutellum very narrowly bordered with orange-yellow. Frons, between the rather broad whitish keels, fuscous, this being visible dorsally. Mesopleuron with a black dot. Tegmina hyaline, tinged with yellow, veins pale yellow, fuscous at the apices of the apical veins. Eyes red-brown. Head much shorter than in *S. agamopsyche*, dorsally very slightly longer than the pronotum medially.

*Male*: pygophor yellow, emarginate ventrally.

Profile sinuate. Anal tube prominent, with a downwardly directed spine on each side far down. Genital styles contiguous at base, diverging thence, spined apically. Oedeagus elongate, subascendant, with a recurved process near the apex.

*Female:* pygophor yellow, ovipositor sheath paler.

Length (male) 4, (female) 4⅞ mill.

Hab. Viti Levu, Rewa (Mar., M.), Navua (Feb., M.), Ba (Jan., M.), (Muir's Nos. 54 and 140), on *Saccharum officinarum* and grass.

### *Saccharosydne*, gen. nov.

Closely allied to *Stenocranus*, but whereas, in the latter the radial vein forks nearer to the base than does the brachial, in *Saccharosydne* the reverse is the case, the radial fork in the latter being very short. There are 7 apical cells. the 4th being pedicellate. The head dorsally is very similar to that of *Stenocranus*, but is angular in profile. the latter being rounded. In profile, the head is very similar in appearance to that of *Tropidocephala*. but the latter is at once separated by the absence of cross keels on the vertex. Tibial spur broad, usual type with many small teeth. Type *saccharivora* (Westwood).

### 1. *saccharivora*.

*Aphis sacchari* (p.) Anon., 1833 (Mag. Nat. Hist., VI 407. f. 54b. [incorrect]—not described.

*Delphax saccharivora* Westwood, op. cit. 409, figs. 54*a* and *c* [incorrect]; and 1834 op. cit., VII 496 and 610; Ballou 1905 W. I. Bull., VI, 41 .

*Stenocranus* (?) *saccharivorus* Van Duzee 1897 Bull., Buffalo Soc., V, 232 and 1907 op. cit.

*S. saccharivora* Kirkaldy 1906 Bull. Ent. H. S. P. A., I, 409.

This species was originally confused with an Aphis (probably *A. sacchari* Zehntn., but I have not seen specimens).

It is easily recognized by its immaculate pale green colour; spur-spines, &c., black spur with 18-20 spines.

The nymphs differ but little from the adult, excepting the usual manner, and have 2 parallel keels on the frons, close together and not uniting.

### *Hadeodelphax.*

There are at least two Australasian species:

1 Head in profile extending almost or quite the length of the eye in front of the latter.........................1 *pluto*

1a Head in profile scarcely as much as half of the length of the eye, in front of the latter .....................2 *persephone*

### 1. *pluto.*

Pl. XVII, fig. 12.

Macropterous form: the posterior angle of the scutellum is white, and the median keel of the pronotum is sometimes pale.

*Male*: pygophor sinuately rounded viewed from the end. The genital styles are recurved and broadly bifid at their ends.

Length (brach.) 3½, (macr.) 4¼ mill.

Hab. Queensland, Cairns, (July-Aug., P.), Lucinda Point (July, P.); Fiji, (Feb., K.), Navua (Feb., M.), Ba (Jan., M.), Rewa (Apr. and Dec., M.).

### var. *pallidior* nov.

I hesitate to describe this as a species, as I have seen only females, and *H. pluto* is certainly subject to natural decoloration.

Macropterous form: Testaceous, frons piceous brown, more or less paler laterally; pronotum obscurely marked with pale brown and scutellum with an obscure longitudinal stripe on each side of the middle. Tegmina faintly smoky, hyaline, veins mostly dark, first and second apical cells more or less colourless, fifth to eighth more or less dark smoky. Sterna paler than in the type.

Brachypterous form: Pale brownish testaceous, paler beneath; tegmina narrowly smoky apically, commissure whitish, brown near the apex of clavus.

Length (brach.) 2¾, (macr.) 4 mill.

Hab. Queensland, Cairns (Aug., P.); Fiji, (March, K.), Ba (Jan., M.), Rewa (Apr. and Dec., M.).

### 2. *persephone* sp. nov.

Pl. XVII, figs. 10-11.

Black; vertex, frontal keels dorsally, keels of pronotum and sides of the latter, central keel and posterior angle of scutellum, commissure (interrupted in the middle), whitish. Antennae and legs whitish or whitish testaceous. Tegmina dark smoky, first and second apical cells and the apex of the subcostal cell, hyaline, veins blackish-brown; wings hyaline, veins blackish-brown. The pronotum and scutellum are often more or less decolored (sometimes there are 2 black specks on apical margin of vertex). The vertex proper (basal compartment) does not extend anteriorly so far as the apical margin of the eyes.

*Male*: genital segments dark brownish. Inside margin of pygophor sinuate. The oedeagus serrate marginally. The genital styles are very irregular in form.

*Female*: genital segments dark brownish, ovipositor-sheath paler.

Length (brach.) 3, (macr.) 3½-4 mill.

Hab. Queensland, Cairns (July-Aug., P.).

### *Tropidocephala.*

*Tropidocephala* Stal. 1853 O. V. A. F., XI 226 (type *flaviceps*).

*Nephropsia* A. Costa 1862 Ann. Mus. Zool. Napol. I 76 (type *elegans*).

*Conicoda* Matsumura 1900 Ent. Nachr., XXVI 258 (type *graminea*).

*Orchesma* Melichar 1903 Hom. Ceylon 94 (type *marginepunctata*).

*Ectopiopterygodelphax* Kirkaldy 1906 Bull. H. S. P. A. Ent. I, 412. (type *eximius.*)

*Smara* Distant 1906 Faun. Ind. Rh. III, 478, (type *festiva*).

I think these are all synonymous. Tibiae apically with 5 short, black, equal spines as viewed ventrally; spur short, broad, a little concave on one side, without teeth.

*Male*: pygophor with one spine on or near the lip in the middle.

There are about a dozen species, distributed from Southern Europe to South Africa and to Australia and Japan. The three Australian forms may be differentiated as follows: (in all three, the tegminal veins are granulate and more or less hairy).

1 Nodule near the apex of median vein conspicuous, much larger than the one near the apex of radial, the median nodule split into two small ones which are not contiguous. Tegmina more or less dark with hyaline spots.........(2)

1a The brachial nodules seem a little uncertain. Tegmina pale, concolorous. Nodules are small, not very conspicuous.... ........................................... 3 *hamadryas*

2 Vertex about twice as long as pronotum, clavus dark smoky.......................................... 2 *dryas*

2a Vertex little longer than pronotum. Clavus dark smoky but widely pale greenish along the sutural margin. 1 *eximius*

### 1. *eximius* (Kirkaldy).

Pl. XII, figs. 5-7, and Pl. XVII, figs. 15-16.

Add: Clavus more or less widely pale greenish along the sutural margin. Tegmina granulated with whitish, with short, stiff hairs. Genae black, clypeus pale. Antennae pale, marked with black.

The male pygophor is figured (Pl. XVII, figs. 15-16), but neither the artist nor myself has been quite able to make out the structure and I think the interior is partly filled with excretion. I have not had sufficient material for dissection. The lateral margins of the pygophor are greatly sinuate, being produced about the middle and also very curiously towards the dorsum. There is one rather blunt spine near the lip. The genital styles are slender and curve inwards somewhat. There are also two smaller spines dorsal of these, which seem to be appendages of the oedeagus.

Length 3½-4 mill.

Hab. Queensland, Cairns (July-Aug., P.).

### 2. *dryas* sp. nov.

Pl. XII, figs. 1-4, and Pl. XVII, figs. 4-5.

Allied to *eximius*, but differs as follows:

Frons dark apically and basally, clypeus pale. Pronotum with a black spot at the side (sometimes obscurely indicated in *eximius*). Clavus concolorous, dark smoky. Vertex about twice as long as pronotum, frons narrower than in *eximius*, longer and curved in profile.

The *male* pygophor is very different in appearance from that of *T. eximius*, though the generic character of the single ventral spine is present. The form is more oblong, the sides sinuate and rather bluntly toothed laterally on the ventral margin. The genital styles are very long and curve twistingly near their apex.

The oedeagus seems to arise near the anal tube, and is long and slender, and a little curved.

Length 3½-4 mill.

Hab. Queensland, Cairns (July-Aug.), Bundaberg (Sept.-Dec.), Kuranda (Aug.).

### 3. *hamadryas* sp. nov.

Head formed as in *dryas*, but colour different and instead of the large dark median nodule, there are 2 non-contiguous, much smaller, pale ones. It is a rather hairier species. Pale greenish, a thin black line on either side of the median keel of the vertex apically. Antennae pale green, annulated with black. Tegmina hyaline, the smoky pattern much as in *dryas*, but very faint; a few scattered darker specks on the apical third. Legs pale testaceous.

*Female*: genital segment testaceous.

Length 4¼ mill.

Hab. Queensland, Cairns (Aug.).

### *Anectopia*, gen. nov.

Closely allied to *Eurysa* Fieber, but the veins of the tegmina in the long-winged form are more complicated apically and the bracial is forked apically.

Head dorsally transverse, not extending apically beyond the eyes; vertex transverse, its two compartments each having a puncture in the middle. Frons broad, median keel almost absolete (*mandane*) or clearer (*igerna*). Antennae scarcely reaching to apical margin of frons, second segment about twice as long as the short first. Pronotum shorter and a little wider than the head, lateral keels turning more or less outwards; there is a puncture on each side of the middle keel. Tibial spur broad at base, foliaceous, with about 40 small, closely-set teeth.

### 1. *mandane* sp. nov.

Pl. XI, figs. 11-13 and 17; Pl. XIV, figs. 4-6.

*Long-winged* form. Vertex, genae, pronotum, antennae, legs, etc., more or less dark testaceous; frons and clypeus dark fuscous ,the former gradually deepening to black towards the apex. Sterna, scutellum and abdomen, very dark fuscous or blackish, except the base of the abdomen above (as also most of the metanotum) and abdomen below partly, orange sanguineous. Tegmina hyaline, second apical vein suffusedly, and 5th and 6th (and apex of 4th) apical cells, fuscous; tegminal veins pale, feebly granulate.

*Short-winged female*. Ovoid, the whole surface shining. Vertex, antennae, frons, pronotum, scutellum, sterna, legs, etc., testaceous more or less tinged with fuscous. Tegmina more or less dark fuscous, subopaque, a little paler internally. Abdomen blackish and fuscotestaceous. Tegmina somewhat convex, not quite reaching so far as the base of the genital segment, apically rounded.

*Short-winged male* like the long-winged form of the same sex, but the frons paler fuscous; tegmina subopaque, pitchy, not reaching to the apex of the abdomen.

*Male* pygophor, lip produced suberectly, margin doubly notched close to that point. Genital styles broad at the base, narrowing apically, the apex being acute. The oedeagus is horizontal, projecting between the blunt ventral projections of the anal tube.

Length male, female (macr.) 4, male (brach.) 2 mill.

Hab: Queensland, Cairns (July-Aug.), Kuranda (Aug.).

### 2. *igerna* sp. nov.

Dark fuscous or blackish-brown; frons a little paler. Antennae fusco-testaceous; legs testaceous.

### 1. *iuncicola* sp. nov.

Pl. XII, figs. 8-9.

Brownish testaceous, frons with scattered yellower specks. Tegmina hyaline, veins brownish or pale yellowish; wing veins dark brown. Tergites yellowish, obscurely spotted submedianly, in a row, with pale brown, in the short-winged form; in the macropterous form, the tergites are more or less suffused with blackish-brown. Tegmina not granulate, not piliferous.

*Female* ovipositor black.

Length: 3½ (macropterous), 2⅞ mill (brachypterous).

Hab: Queensland, Childers (Koebele's No. 2264 in part, on *Juncus*) Bundaberg (Sept.-Dec.).

### 2. *naias* sp. nov.

The *brachypterous females* differ from those of the genotype, by being darker. The tergites are brown with a very narrow yellowish median line; there is a submedian and a lateral stripe on each segment, both being narrow and black, and the former is bordered internally by a narrow yellowish stripe, and externally on the apical three tergites by a similar one, etc.

Length: 3 mill.

Hab: Sydney, New South Wales (Jan., K.).

### 3. *euronotianus* sp. nov.

Separable from *H. naias* by the smaller size, paler colour and longer vertex.

Pale yellow, immaculate. Eyes grey-black. Head dorsally one-half longer than wide between the eyes (in *naias* it is only between ⅓ and ¼).

*Female* ovipositor sheath greyish fuscous.

Length 3 mill (brach.)

Hab: New South Wales, Sydney (Feb., K.).

I have seen females only.

## *Gelastodelphax.*

### 1. *histrionicus.*

Pl. XVI, figs. 1-3 and Pl. XVIII fig. 16.

The male pygophor is very remarkable. The lip is strongly produced on each side, and there are two smaller projections between these. The genital styles are elongate and bent at the apex. The oedeagus is horizontal and is subcultrate with, apparently, a long projection from one side.

### *Smicrotatodelphax.*

#### 1. *perkinsi.*

Pl. XVI, figs. 14-15 and Pl. XVIII fig. 14.

The male pygophor is roundly angular at the lip, and curvedly produced in a somewhat hollow manner dorsally at the sides. The genital styles bear some little resemblance to those of *Perkinsiella saccharicida*, but are more attenuated at the base and thickened inwardly there.

### *Megamelus.*

I have temporarily retained this group as distinct from *Delphacodes*. The species included have the head distinctly produced before the eyes, the junction of the frontal keels almost on the top of the head, the pronotal keels not turning upwards, the first segment of the hind tarsi longer than the other two together. They have a common facies of a broad median longitudinal pale stripe, and dark lateral margins.

It seems to be a generic character that the ventral margin of the male pygophor is deeply emarginate 3 or 4 times; it is so at least in *M. notula*, *persephone* and *proserpina*.

#### 1. *proserpina* sp. nov.

Pl. X, figs. 5-7 and Pl. XII, figs. 19-21.

Blackish fuscous with a broad, pale, ivory white band from apex of vertex to apex of abdomen, usually interrupted broadly on the middle of the abdomen, the pale colour of the abdomen is also rather yellower. Frontal keels paler fuscous. Sterna and sternites largely blackish fuscous; labium, antennae and legs pale, the antennae tinged with brownish; fore tarsi and first segment of hind tarsi blackish fuscous. Tegmina subhyaline, blackish fuscous, paler internally and exteriorly, greater part of commissure ivory white. Wing veins blackish fuscous. Antennal segments subequal. Tegminal veins not or scarcely granulate.

*"Delphax"*

*Kelisia* Fieber, l. c. type *guttula* (Germ.)
*Chloriona,* Fieber, l. c. type *unicolor* (H.-S.)
*Delphax* Fieber, op. c., 520, (nec Fabr.)
*Delphacinus* Fieber, l. c. type *mesomelas* (Boh.)
*Delphacodes* Fieber, op. c., 524 type *mulsanti* Fieb.
*Liburnia* auctt. nec Stal.
*Chlorionidea* Loew 1885 Verh. Zool. bot. Ges. Wien XXXV 356 type *flava* Loew.
*Delphax* Fieber, op. c., 520 (nec Fabr.)
*Delphacissa* Kirkaldy 1906 Entom, type *uncinata.*
*Sogata* Distant 1906 Faun. Ind. Rhynch. III, 465, type *dohertyi* Dist.
*Nilaparvata* Distant l. c. type *greeni* Dist.

The above citation does not mean that I consider all these groups to form one genus, but simply that I cannot yet arrange the Australian and Fijian species under them, on the characters proposed for them. One difficulty lies in the large proportion of forms known only in a brachypterous state. Then again I place little reliance on many trusted characters.

Distant has used the length of the head, both dorsally and ventrally, as a principal character; this I cannot admit. The fact that the head is longer than wide dorsally as opposed to not longer than wide, if unaccompanied by other strong characters, is to me of no generic value. The same, in perhaps a rather less degree, with the frons, and also in this case as regards the contour. The comparative length of the cylindric antennae is also, within certain limits, not I think, of generic value.

Great stress is laid on the lateral keels of the pronotum, except by Distant, who disregards them. This seems to me a somewhat variable character and in any case a very difficult one to appreciate. In a few forms these keels are no doubt sharply separable into two categories, viz: (1) those which are straight, scarcely divergent posteriorly and reach the posterior margin of the pronotum, and (2) those which curve under the eyes and never reach the posterior margin. There are a large number of forms however which are intermediate, which proceed straightly in fact but fork not far from the posterior margin and proceed obscurely in two directions, under the eyes and obscurely to the posterior margin. There are also intermediate forms between the two. Moreover in forms in which these keels curve under the eyes in long-winged forms, there seems to be a tendency towards a straightening of the keels in the short-winged forms. The venation is of comparatively small value. The relative proportion of the first segment of the hind tarsi to the other two together is used as a character of high importance by many authors, but I cannot so regard it.

The characters which appear to me to be of generic value in this section, lie in the genitalia and the tibial spur, though I am not prepared, without the examination of a large series of European and American forms, to formulate genera based on them. ,

I have therefore thought it best to include all the Australo-Fijian species belonging to these "genera", in '*Delphax*', thereby obviating future synonymic difficulties, as *Delphax* is a synonym and has no generic value. It should be noted also that '*Liburnia*' often used for *Delphacodes*, is a strict synonym of *Embolophpora*.

The Australo-Fijian species of this complex are disposed artificially as follows:

1 Head, pronotum and scutellum fuscous or black with a more or less sharply contrasted pale longitudinal stripe..(2)
1a Head, &c., without such a stripe....................(7)
2 Ground colour of head, pronotum and scutellum flavo-fuscous .......................................... (3)
2a The same blackish-brown..........................(6)
3 Long-winged forms: tegmina with internal half of membrane smoky ................................(4)
3a Short-winged forms..............................(5)
4 Narrower and longer, keels more pronounced..13 *geranor*
4a Broader and stouter, keels less pronounced....12 *kolophon*
5 Tegmina dark apically, with separate round black spot at apex.......................................14 *kaha*
5a Tegmina dark apically, without separate round black spot. ......................................15 *leimonias*
6 Long-winged form: tegmina more or less hyaline:
A. Head dorsally not longer than wide.....16 *anemonias*
AA. Head dorsally distinctly longer than wide.22 *eupompe*
6a Short-winged form: tegmina dark, with a narrow white border.................................17 *pylaon*
7 Frons yellowish, pale fuscous, or subsanguineous, practically concolorous.............................(8)

7a Frons with the lateral keels paler than the ground colour. .......................................... (11)
8 Frons dull yellowish or testaceous..................(9)
8a Frons shining, fuscous or subsanguineous...........(10)
9 Hind margin of pronotum widely angulately emarginate. .......................................... 3 *parysatis*
9a Hind margin truncate.........................2 *ordovix*
10 Middle keel on face, especially on clypeus, paler than the ground colour. ................................9 *hyas*
10a Middle keel concolorous with the disk.......10 *disonymos*
11 Ground colour of frons pale yellow................(12)
11a Ground colour dark yellow..........................(15)
12 Tegmina blackish. .........................8 *matanitu*
12a Tegmina yellowish hyaline. .......................(13)
13 Head dorsally longer than wide................11 *ochrias*
13a Head dorsally not longer than wide................(14)
14 Male: pygophor blackish. ....................7 *lazulis*
14a Male: pygophor yellowish. ....................6 *dryope*
15 Head distinctly produced in front of the eyes........(16)
15a Head not, or scarcely, produced in front of the eyes...(18)
16 Tegmina dark fuscous, whitish opaque apically.......... .................................. 5 *albotristriatus*
16a Tegmina hyaline or cinereous or fuscous, immaculate..(17)
17 Frons long and narrow, lightly and gradually narrowing basally; lateral keels of pronotum not curved under the eyes, but reaching posterior margin of pronotum.4 *ostorius*
17a Lateral margins of frons slightly sinuate, a trifle broader apically than basally; lateral keels of pronotum curving outward, not reaching posterior margin of pronotum..... ....................................... 1 *thyestes*
18 Long-winged forms. ...............................(19)
18a Short-winged forms. ..............................(20)
19 Scutellum black. .........................19 *astyanax*
19a Scutellum with the hind angle white............18 *puella*
20 Apical margin of tegmen very narrowly white........(21)
20a Apical margin not continuously white.........20 *algebra*
20b Apical margin rather broadly white..........17 *astyanax*
21 Tegmina deep fuscous.........................21 *dilpa*
21a Tegmina pale, partly smoky...................18 *puella*

### 1. *thyestes* sp. nov.

Pl. X, figs. 12-13.

Fuscous or blackish-brown, head and keels yellowish fuscous. Antennae and legs fuscous. Pronotum and scutellum dirty yellowish-grey, middle keel and posterolateral margins of the latter sometimes very narrowly pale, two obscure pale longitudinal stripes.

Head dorsally longer than wide, produced a little in front of the eyes, vertex with a keel down the middle. Frons a little broader apically than basally, keels distinct, but filiform. Antennae reaching beyond the base of the clypeus, segments nearly subequal in length. Pronotum with lateral keels fairly straight but very divergent, not reaching the hind margin, but continuing parallel with it in the form of 2 or 3 granules, hind margin very obtuse-angularly emarginate. Tibial spur with about 16 well developed spines, first segment of hind tarsi longer than the other two.

*Long-winged form*: Scutellum about twice as long as pronotum. Tegmina hyaline cinereous, with 7 apical cells, generally unforked (this varying in the same individual), veins feebly granulate, pale yellowish fuscous.

*Short-winged form*: Scutellum shorter than pronotum. Tegmina reaching to about one-half of the length of the body, hyaline cinereous, apical margin subcrescentiformly pale with a dark fuscous spot (this may be obscurely marked); not quite contiguous apically, apical margin subtruncate, a little rounded.

Length 3 (brach.)-4⅛ (macr.) mill.

Hab. Queensland, Bundaberg (Nov.), Brisbane (June).

Only females have been seen.

This species does not fit into any described genus, being perhaps partly *Chloriona*, partly *Delphacissa*.

### 2. *ordovix* sp. nov.

This short-winged form is similar in appearance to that of *D. thyestes*, but the vertex is shorter and narrower, the frons yellowish fuscous, concolorous, polished and shining, parallelsided, the keels filiform and not prominent. First antennal segment about three-fourths the length of the second. Lateral keels of pronotum curved under the eyes. Tegmina apically rounded, shining, obscure yellowish fuscous, apex of clavus with a dark spot. Tibial spur with about 30 minute spines; first segment of hind tarsi longer than the other two.

Length 3 mill

Hab. Queensland, Brisbane (June, No. 2264 in part.).

I have seen only one female.

This species is apparently a *Delphacodes*.

### 3. *parysatis* sp, nov.

Pl. X, figs. 10-11.

Allied to the last, but the legs, &c., are testaceous, and the pleura are not noticeably marked or spotted. Head dorsally scarcely as long as broad. Pronotal keels as in *thyestes*. Tibiae and tarsi as in *ordovix*.

*Long-winged form*: tegmina hyaline tinged with yellow, apical veins infuscate and a small dark lanceolate spot near the apex of the clavus. Scutellum about two and a half times as long as the pronotum which is obtuse-angularly emarginate.

*Short-winged form*: allied to that of *ordovix* but the legs &c., are testaceous, and the pleura are not noticeably spotted or marked. Pronotum about as long as scutellum.

Length (Macr.) 4¾, (brach.) 3½ mill.

Hab. Queensland, Cairns (Aug.).

Only females, unfortunately, of this species which is more or less a *Delphacodes*.

### 4. *ostorius* sp. nov.

Pl. XVI, figs. 10-11.

Head dorsally longer than broad. Vertex with a keel down the middle. Scutellum about twice as long as pronotum. Tibial spur with about 23 spines, hind tarsi as in the last.

*Long-winged male*: Dark fuscous or blackish brown, with pale keels, legs, etc. Tegmina dark fuscous, subhyaline, immaculate, with 7 apical cells, the third apical vein being also forked, veins very feebly granulate.

*Short-winged female*: Similar in appearance to *D. thyestes*, but the frons is long and narrow, slightly and *gradually* narrowing basally. Lateral keels of pronotum not curved under the eyes, but reaching posterior margin of pronotum. Tegmina immaculate, apically broadly rounded, reaching to about one-half of the entire length of the insect. First antennal segment about one-half of the length of the second.

*Male* pygophor rounded at the end, the dorsal margin produced at each side, the produced part flattened and bent over at the end. The genital styles are compressed, the apices somewhat acute and bent.

Length 2¾ (brach.) 4 (macr.) mill.

Hab. Queensland, Cairns (Aug., 2264 in part).

### 5. *albotristriatus* sp. nov.

Pl. XX, figs. 15 and XIV, figs. 1-3.

*Shortwinged form* allied to *thyestes.*

Dark fuscous, or blackish, a little less dark on the vertex. Eyes castaneous or fuscocastaneous. Antennae, keels on frons and clypeus, legs, etc., fuscotestaceous. Pronotum (except ventrally), posterolateral margins of scutellum, subcostal vein, apical margin of tegmina broadly, last two or three tergites, etc., opaque whitish.

Keels all strong, even on the clypeus. Head dorsally longer than wide, produced a little in front; frons widening curvedly towards the apex but narrowing very slightly at the apical margin. Pronotal keels divergent, not curving under the eyes and not reaching the hind margin. Scutellum shorter than pronotum. Tegmina nearly square, extending to about half the length of the abdomen, subtruncate apically and contiguous along the commissure. Tibial spur with about 16 well developed spines, tarsi as in the last.

*Male* pygophor apically rotundate oval, the rim thickened about the anal third and produced there in a short spine. Genital styles broad, bifid apically.

Length 2¼ 2¾ mill.

Hab. Queensland, Brisbane and Bundaberg (Nov.).

I have seen males only.

### 6. *dryope* sp. nov.

Pl. XVI, figs. 12-13.

Somewhat like *D. osborni.*

Yellowish testaceous, frontal and clypeal keels whitish-yellow. the former very narrowly bordered internally with dark fuscous. (in the males the keels are less broad and less whitish). Pronotal keels whitish yellow, a dark fuscous spot on each side anteriorly. Scutellum medio-longitudinally pale with a pale brownish-yellow sinuate line on either side. Underneath pale testaceous, a fuscous spot on each mesopleuron. Tegmina hyaline, veins pale except the apical ones, which are fuscous. Lateral margin of frons subparallel, slightly narrowed basally, a little more so in the male than in the female, keels rather flattened. Antennae not reaching beyond base of clypeus, second segment nearly twice as long as the first. Pronotum as in *osborni*. Tibial spur with about 27 spines. Tegmina with 8 or 9 apical cells, the 4th, 7th being pedicellate.

*Male* pygophor pale yellowish: subrotundate viewed end-on, the lateral margins thickened and produced into a short spine near the anal tube Anal tube with a elongate, strong, downward directed tooth from its ventral wall on each side, and about 5 tiny spines between oedeagus subhorizontal, elongate. Genital styles divergent, apically bifid.

*Female* abdomen beneath more or less fuscous.

Length (brach.) 2½ (macr.) 4½ mill; both sexes are dimorphic.

Hab. Queensland, Cairns (Aug.) Redlynch (July) Kuranda (Aug.) ; Fiji, Rewa (Dec., Muir).

### 1. *lazulis* sp. nov.

Pl. XVIII, figs. 1-3.

I can distinguish this from the last described only by the rather smaller size, by the blackish pygophor in the male and different genitalia in that sex I think the females would be very hard to tell apart from those of *dryope*. I have seen only brachypterous forms.

*Male* pygophor blackish, subrotundate viewed end-on, the lateral margins somewhat sinuate; anal tube with a projection on each side, pointing downwards. Genital styles not unlike those of *dryope*, but the outer apical angle blunter.

Length 1⅞ mill.

Hab Queensland, Cairns (Aug.), Redlynch (July).

### 8. *matanitu* sp. nov.

Pl. XVI, figs. 4-5; & Pl. XVIII, fig. 15.

Pale brownish-yellow, or yellowish-testaceous, keels of frons slightly paler.

Tegmina black. Head dorsally scarcely extended before the eyes. Pronotal keels curvedly divergent. Spur with 15 or 16 spines.

*Male*: pygophor in profile greatly emarginate ventrally. Genital styles divergent, the apices truncate and thickened.

Length 2 mill. (brachypterous).

Hab. Viti Levu, Rewa (Dec., M.), Ba (Jan. ,M.), Navua (Feb., M.).

The vertical cross keels are obscure and are not shown on fig. 15 of Pl. XVIII.

### 9. *hyas,* sp. nov.

Somewhat like *dryope,* but the keels of the frons are only very slightly lighter than the pale ochraceous disk; antennae not reaching to base of clypeus. Tegmina hyaline, veins pale yellow, tending to pale fuscous on the membrane, granules pale fuscous. Spur with 22 spines.

*Male*: pale ochraceous; tergites broadly fuscous medio-transversely, orange basally. Sternites more or less dark fuscous partially, pygophor suffused with fuscous beneath.

*Female*: almost uniform, more or less pale ochraceous.

Length 3⅓ mill.

Hab. Queensland, Redlynch (July), Kuranda (Aug.).

### 10. *disonymos* sp. nov.

Pl. XVIII, fig. 4.

Allied to the last. Pale yellowish testaceous. Head very slightly produced before the eyes; lateral margins of frons subparallel, slightly narrowed basally,keels flattish. Antennae not reaching beyond base of clypeus. Lateral keels of pronotum curving outwards. Tegmina with 6 unforked apical cells. Spur with 16 spines.

*Male*: pygophor rounded, subtransverse viewed end on. The genital styles are elongate, gradually widening a little towards the apex, where they are truncate.

Length 3¾ mill.

Hab. Fiji, Rewa (male, Apr., M.), Suva (female Mar.,K.).

11. *ochrias* sp. nov.

Has the head form of *Chloriona*.

Ochraceous or testaceous. Sterna, legs, etc., paler, a narrow somewhat paler median line down the tergites (and in the macropterous form, the space between the lateral keels of pronotum and scutellum is paler). Antennae not reaching to apex of frons, first segment scarcely longer than wide.

*Long-winged forms*: veins feebly granulate.

*Short-winged forms*: tegmina narrowly rounded, reaching to about half the space between the tegulae and the apex of the abdomen.

Length 3½ (macr.), 2½ mill. (brach.).

Hab. New South Wales, Sydney (Jan., Koebele's No. 2232), Fiji (Mar., K.), Rewa (Mar., M.).

Koebele & Perkins collected one imperfect macropterous and 15 brachypterous adults and 3 nymphs, all females. The type is a macropterous female from Fiji, taken later by Muir.

To this species probably also belong some forms in which the ochraceous is replaced (as is sometimes the case in other ochraceous species) by orange-sanguineous or sanguineous.

Hab. Queensland, Bundaberg (Sept.-Nov.), Brisbane (June) Cairns (Aug.).

12. *kolophon* sp. nov.

Pl. XV, figs. 9-11.

Testaceous, somewhat paler on pronotum and scutellum medianly; frons, between lateral keels and central keel, sometimes pale fuscous. Pronotum and scutellum more or less fuscous exterior to the lateral keels.

Tegmina hyaline, veins pale; interior two-fifths smoky, the veins on this fuscous; subcostal vein smoky, commissure whitish.

Antennae not reaching to apical margin of frons, second segment twice as long as the first.

*Male*. Tergites, including pygophor, dark fuscous or blackish-brown, a transverse yellowish-brown, or orange, sanguineous band near the base. Sterna and sternites mostly dark fuscous, the latter basally yellowish-brown, with a spot or two laterally. Pygophor subtrotundate, viewed end on, the outline sinuate. Anal tube with 2 elongate spines from the middle, directed downwards, almost embracing the upwardly directed oedeagus. Genital st broad basally, subconstricted just before their bifurcation, forks being long and acute.

*Female.* Sterna and abdomen pale yellowish-orange; tegm not so smoky as in the male. Pronotum and scutellum scarc fuscous laterally.

Length 3 mill.

Hab. Queensland, Redlynch (July), Cairns (Aug.), Kuran (Aug.).

The keels are not very prominent.

### 13. *geranor,* sp. nov.

Pl. XVI, fig. 3.

Superficially like *kolopohn,* but narrower and longer ,keels more pronounced, etc.; median longitudinal stripe from head to scutellum whiter. Frons intercarinally fuscous. The male genitalia are also very different.

*Male*: pygophor rather elongate viewed end-on, and thickened inwardly at the sides. The anal tube has a lateral spine on each side directed downwards and apparently 2 downwardly and outwardly directed spines between the above. Oedeagus of remarkable form (shown in the figure). Lip produced somewhat in the middle. Genital styles contiguous longitudinally at base, diverging their lateral margins angulate in the middle, apically truncate, the apical angles on each side being acute.

Length 3⅓ mill.

Hab. Queensland, Cairns (July).

### 14. *kaha* sp. nov.

Pl. XVI, figs. 8-9.

Dark brownish-black, a whitish median stripe on head dorsally, pronotum and scutellum. Commissure basally the same. Frontal keels, antennae, legs, spots on pleurites, etc., yellowish testaceous. Tergites orange-yellow, more or less marked with fuscous, especially lateral. Spur with 15 teeth. Pronotum with lateral keels curvedly divergent.

*Long-winged*: tegmina milky hyaline and dark fuscous (as shown in figure).

*Short-winged*: tegmina fuscous, commissure whitish, a black spot on apical margin of tegmina.

*Male*: pygophor with sinuate outline. Lip produced. Anal tube without spines. Oedeagus with a curious angularly bent appendage. Genital styles rather small, obliquely truncate basally, nearly touching apically.

Length 3 (Mar.), 2 (brach.) mill.

Hab. Queensland, Kuranda (Aug.).

### 15. *leimonias* sp. nov.

*Short-winged form*: closely allied to the last, but tegmina dark fuscous subhyaline, apically opaque, margins ivory-white, broken in places by the dark tint. Median keel of frons and clypeus ivory-white. Tergites dark fuscous, medianly white.

Length 2⅓ mill.

Hab. Queensland, Cairns (Aug.).

I have only seen females.

### 16. *anemonias* sp. nov.

Pl. X, figs. 1-2 and Pl. XVI, figs. 1-2.

Dark brownish black. Head dorsally, pronotum and scutellum with a broad median, ivory-white stripe. Commissure and frontal clypeal keels narrowly, lateral and posterior margins of the ventral part of the pronotum, tegulae, etc., white. First segment of the antennae blackish brown, second dark fuscous. Lateral keels of pronotum and scutellum narrowly obscurely ferruginous. Tegmina hyaline, veins pale fuscous except the very pale subcosta, outer fork of radial, etc. Femora more or less dark fuscous, tibiae and tarsi testaceous. Pleurites bordered pallidly, more or less. Head not extending anteriorly in front of eyes. Lateral keels of pronotum curvedly divergent. Spur with 19 spines.

*Male* pygophor apically truncate in profile. Oedeagus horizontally projecting near the anal tube. Genital styles broadening towards the apex, which is truncate, inner margins irregularly sinuate.

Length 3 ⅓ mill.

Hab. Queensland, Redlynch (July), Cairns (July-Aug.). Kuranda (Aug.).

### 17. *D. pylaon* sp. nov.

Pl. XV, figs. 12-14.

Close to the last, but the lateral keels straightly divergent, and spur with 19 spines.

*Long-winged form* (male) tegmina much shorter. Ground color of pronotum and scutellum paler fuscous, lateral keels white; the mesosterna bordered exteriorly with white.

*Short-winged form* (female of same species?); blackish-brown, lateral keels of pronotum white. Tegmina subhyaline, dark fuscous, rather broadly (comparatively) bordered exteriorly from exterobasal angle to interobasal angle with ivery-white. Tergites with a median line of ivory white and a lateral and two sublateral, similar (but more broken up) lines.

*Male* pygophor triemarginate towards, and at the ventral margin. Genital styles widening out towards their apex, which is subtruncate, the angles rather rounded, the inner margins on the apical half, irregularly sinuate. Oedeagus arising close to the ventral wall of the anal tube and bending outwards and downwards, a little over the genital styles. There are no spines on the anal tube ventrally.

Length 2½ (macr.), 2¼ (brach.) mill.

Hab. Queensland, Cairns (July), Brisbane (June).

### 18. *puella.*

Pl. XV, figs. 1-3.

*Liburnia puella* Van Duzee; Forbes and Hart 1900 Bull. Illinois Agr. Sta. 60 p. 416. Pl. 1, f. 2.

Hab. Queensland, Cairns (Aug.), Redlynch (July); Fiji, Suva (Mar., K.).

Also from North America, New Jersey, New York, Iowa and Mississippi (Van Duzee), Ohio, Kentucky (Swezey), Illinois (Forbes & Hart), on grass, grains and sugar beet.

The basal segment of the antennae varies from testaceous to blackish. The middle keel of the frons in the Australasian individuals is usually blackish, though sometimes paler fuscous; the Americans are usually whitish. The spur has about 20 spines.

*Male* pygophor oval; anal tube cleft ventrally, with 2 diverging spines. Oedeagus a little swollen apically. Genital styles small and laterally arched, nearly meeting apically. This species is very close to *albicollis*, but is a little larger, the posterior angle of the scutellum white, the frons is coloured differently and the male pygophor different. I am indebted to my friend Mr. Van Duzee for a pair of his *puella*. *

### 19. *astyanax* sp. nov.

Pl. X, fig. 20; Pl. XIV, figs. 13-15. **

Closely allied to *D. puella*, but smaller, the genae and scutellum entirely black, and the lateral margins of the frons more rounded laterally. In the short-winged form, the tegmina are subtruncate, and broadly margined with white apically. Spur with about 14 spines.

*Male* pygophor exceedingly remarkable. The anal tube is elevated and shaped somewhat like a square hood. The lateral margins of the pygophor close to the anal tube project acutely and somewhat curvedly. Genital styles truncate apically, the angles being acute and prominent. The oedeagus has a crown of 4 long spines (or is apically elongately quadrifid in other words).

Length about 1⅞ (brach.), 2¼ (macr.) mill.

Hab. New South Wales, Mittagong (Jan., K.).

### 20. *algebra* sp. nov.

Pl. X, figs. 16-17; Pl. XV, figs. 15-16.

Closely allied to *D. puella* but (in the short-winged forms at least) the tegmina are deeply fuscous and more opaque; basal half of commissure and a tiny spot near the apex internally whitish. The median keel of the frons is rather thick and whitish, and the lateral keels of the pronotum are straight and reach the hind margin. Spur with 33 spines.

*Male* pygophor suboval, broadly produced near the anal tube, which has 2 projections from the ventral wall. The genital styles are widened and truncate apically, the outer angles rounded, the inner acutely produced.

Length 1⅞ mill (brachypterous form only known).

Hab. Queensland, Kuranda (Aug.), Cairns (July-Aug.).

---

* Dr. Melichar kindly sent me some years ago a male of the Sinhalese *albicollis* Motschoulsky, the male pygophor of which is figured Pl. 14 figs. 10-12. It is subrotundate viewed end on and has a flat projection on each side near the anal tube, turning a little outwards and very conspicuous in profile. The anal tube has no spinose projections. The oedeagus is apparently short. Genital styles less arched than in *puella* and dilated apically, being shortly bifid, the angles acute.

** Pl. 10 f. 20 is not quite accurate, the lateral margins of the vertex should be more concave.

### 21. *dilpa,* gen. nov.

Pl. X, figs. 18-19; Pl. XVI, figs. 6-7.

*Short-winged* form similar to *algebra,* but the white apical margin of the tegmina is very narrow, and the male genitalia are very different.

*Male* pygophor suboval, margins sinuate. Oedeagus horizontal, elongate. Genital styles inwardly curved, the apices truncate, angles prominent and acute, or subacute.

Length 1½ mill.

Hab. New South Wales, Mittagong (Jan., K.).

The vertex in Pl. X, fig. 18 is a little too prominent.

### 22. *eupompe* sp. nov.

Pl. X, figs. 3-4; Pl. XII, figs. 16-18.

Superficially like a *Megamelus,* but the male pygophor is not of the *Megamelus*-type. Perhaps a *Kelisia.*

Dark fuscous or blackish; vertex, antennae, pronotum and scutellum, between the lateral keels, legs, commissure, yellowish-white.

Tegmina dark fuscous, first and second, and the outer part of 3rd and 4th, apical cells, a little paler. Veins closely but flatly granulate. Frons laterally acute and subreflexed, gradually narrowing towards the base; the central keel strong but rather flat: antennae short, first segment scarcely half the length of the short second. There are 9 apical cells, 4 and 7 being pedicellate. Tibial spur with 13 spines.

*Male* pygophor somewhat diamond-shaped, and is thickened internally at the middle laterally, anal tube with 2 median, strong, straight spines, between which arises the upward and outwardly directed oedeagus. The genital styles are divergent, elongate, acute, not bifid.

Length 3 mill.

Hab. New South Wales, Sydney (Jan.); Queensland, Cairns (Aug.), Bundaberg (Nov.); Fiji, Suva (Mar., K.).

The cross keels on the vertex in Pl. X, fig. 3 were inadvertently omitted.

## Derbidae.

This family contains the most delicate and remarkable forms of the Fulgoroidea, or even of the Auchenorhynchi. While such forms as *Nisia* and *Philadelpheia* seem to have little in common, there are numerous intermediate forms which render sharp groupal separation difficult. There seem to be two main subfamilies, viz: (1) Nisiinae, represented by *Nisia* in which the last segment of the labium is comparatively elongate, and the anal vein of the clavus strongly granulate, and (2) Derbinae represented by *Philadelpheia*, in which the last segment of the labium is annuliform, generally a little wider apically than basally, and the anal vein not granulate, the latter division being much more numerous in genera and species. Unfortunately in the genera *Thyrocephalus*, *Basileocephalus* and *Phaciocephalus*, we have a small intermediate group in which the anal vein is granulate and the last segment of the labium annuliform.

In the following table of Australo-Fijian genera, I have endeavoured to include those recently described by Distant. As the latter mentions the shortness of the apical segment of the labium as a character of the (sub-) family in the Oriental forms, (he includes *Nisia* in which it is comparatively elongate!), I have supposed that his Australian genera have the same character.

1 Last segment of labium somewhat elongate, (anal vein and head granulate) ................................(2)
1a Last segment of labium annuliform ................(4)
2 Head strongly carinate along the middle....3 *Phaconeura*
2a Head not medianly carinate ........................(3)
3 Lateral keels of frons parallel ..................1 *Nisia*
3a Lateral keels of frons narrowing basally as seen from below ........................................ 2 *Suva*
4 Anal vein of tegmen granulate (*)................(5)
4a Anal vein simple (*)...............................(7)
5 Pronotum more or less normal; vertex anteriorly truncate .............................. 6 *Thyrocephalus*
5a Pronotum laterally laminate, sinuate, recurved, partly enclosing antennae; vertex not truncate anteriorly....(6)

---

(*) Distant has not mentioned in any of his descriptions a most important character, viz-: The granulation of the claval veins and of the head, etc., so that I have arranged his genera under the second division, except *Urabunna*, in which his artist seems to have recognized the importance of the claval granulation, and which is only a synonym of *Basileocephalus*.

6 Lateral keels of frons continuing acutely to apical margin .................................. 4 *Basileocephalus*
6a Lateral keels of frons flattening out apically .............................................. 5 *Phaciocephalus*
7 Antennae not projecting beyond the anterior margin of the head (in profile or dorsally) ....................(8)
7a Antennae projecting beyond the anterior margin of the head .......................................... (23)
8 Antennae scarcely more than twice as long as wide....(9)
8a Antennae more than three times as long as wide......(20)
9 Wings developed ............................. (10)
9a Wings rudimentary ......................... 19 *Muiria*
10 Head narrower than pronotum .....................(11)
10a Head wider than pronotum..............18 *Philadelpheia*
11 Subcostal vein of tegmen simple ...................(12)
11a Subcostal vein of tegmen granulate .........17 *Nesoniphas*
12 Tegmina broader and less elongate, or if elongate then strongly widening apically; wings longer in proportion ......................................... (13)
12a Tegmina narrow and elongate; wings much shorter.... ...................................... 16 *Proutista*
13 Vertex transverse, apically truncate, separated from frons by a transverse keel, scarcely extending before the eyes ...................................... 7 *Lamenia*
13a Vertex more or less elongate, distinctly not transverse. (14)
14 Vertex elongate, apically truncate, tegmina widening very strongly towards the apex ................15 *Lyricen*
14a Vertex with lateral margins acute and parallel, not separated from the frons by a cross keel...........8 *Rhotana*
14b Vertex elongate, angulate, extending in front of the eyes ......................................... (15)
15 Antennae not (or very feebly) tuberculate .........(16)
15a Antennae subrotundate, strongly tuberculate.....13 *Kaha*
16 Head sublinearly elongate as seen dorsally, more than four times as long as an eye...................14 *Vivaha*
16a Head not as above .............................(17)
17 Lateral margins of vertex narrowly (or not) reflexed, closer at base, feebly sensorized ....................(18)
17a Lateral margins of vertex more reflexed, well separated at base, usually strongly sensorized ...............(19)
18 Antennae short ..............................9 *Levu*

18a Antennae elongate, flattened and compressed, elongate-oval in profile ..............................10 *Niphadodite*

19 Genae simple ..........................11 *Pyrrhoneura*

19a Genae with a small subrotundate, laminate appendage.... ..................................12 *Nesocore*

20 Antennae, subcylidric, granulations feeble....20 *Heronax*

20a Antennae more or less flattened, with very conspicuous granulations ..................................(21)

21 Head not longer than the nota, lateral margins of vertex not sinuate ......................21 *Nesophantasma*

21a Head longer than the nota, lateral margins of vertex sinuate .......................................(22)

22 Head in profile only slightly ascendant, only slightly sinuate, broad .........................22 *Phantasmatocera*

22a Head in profile curved and recurved, subascendant, narrow ..................................23 *Swezeyia*

23 Wings very little shorter than the tegmina, vertex elongate ..................................24 *Kuranda*

23a Tegmina twice as long as the wings, head comparatively short ....................................(24)

24 Antennae cylindric; tegmina subparallel, apically subobliquely truncate .........................25 *Zoraida*

24a Second segment of antennae deeply constricted near the apex (*); tegmina widening at the middle, apically subangulately rounded ......................26 *Sikaiana*

## *Nisia.*

### 1. *atrovenosus.*

Add: Fiji, Rewa (March-Apr., M.), Ba (Jan., M.), Navua (Feb., M.). Melichar has also recorded it from Abyssinia, Haro-Bussar (1904 Verh. Zool. bot. Ges. Wien LIV 34) and Distant from the Indian mainland (Faun. Ind. Rh. III, 309, fig. 150).

## *Suva.*

The tegminal venation is very similar to that of *Nisia*, but there are two obliquely transverse veins in the subcostal cell (in the apical half), the median apical vein is forked (though this would probably vary in a long series, as it does in *Nisia*), and the lower apical part of the tegmen is more venose, more as in *Kermesia*. The head is depicted on Pl. IX, figs. 14-16.

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* Distant erroneously treats this as two segments.

## *Basileocephalus.*

*Basileocephalus* Kirkaldy.
=*Urabunna* Distant 1907, op. c., 414.

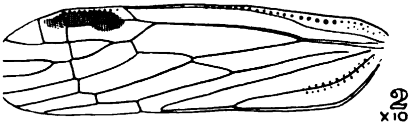
The care with which Mr. Distant has really studied my descrip- ns, is shown by his appreciation of my genus *Basileocephalus.* though I specially remarked on the curious laminate recurved eral margins of the pronotum, Mr. Distant supposes that this nus is closely allied to his *Sikaiana,* in which the pronotum ars no conceivable resemblance to such a description, while : latter fits that of his *Urabunna.* Mr. Distant has neglected notice the sensory organs on the vertex and the granulated al vein of the clavus, though the latter character has been no- ed and included by his acute artist.

### 1. *thaumatonotus.*

Pl. IX, figs. 9-11, and Pl. XIX, fig. 20.

*B. thaumatonotus* Kirkaldy.
=*U. lineata* Distant, l. c., fig. 7.

I imagine Distant's species to be a synonym of the above, but does not mention that the tegminal veins are noticeably coral- l.



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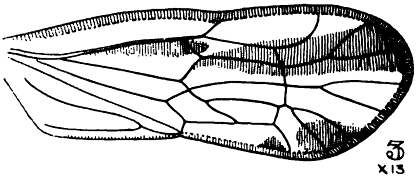
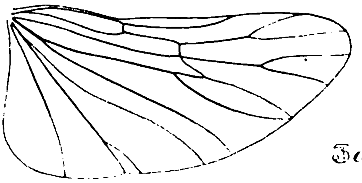


3 ×13



3a

## *Phaciocephalus.*

I inadvertently placed this genus among those with the last segment of the labium fairly long; it is, however, subannuliform.

The venation of the tegmen and wing is shown in the text figure attached (No. 3).

The six species, all Fijian, are separable as follows:

1 Tegmina with red or orange markings................(2)
1a Tegmina not marked with red or orange..............(3)
2 Inner half of tegmen reddish with 2 long yellowish spots on the margin; tegmen not at all smoky.........4 *miltodias*
2a Inner half of tegmen reddish, the inner margin creamy (sometimes interrupted by the ground colour close to the apex of the clavus), this inner half largely smoky, especially apically .........................3 *nesodreptias*
3 Tegmen creamy with a greyish brown longitudinal stripe (4)
3a Tegmina whitish with the veins greyish-black and broadly marked ............................. 6 *minyrias*
3b Tegmina pitchy, subcostal cell yellowish white..... *pullatus*
4 Tegmen with the greyish black stripe not connected with the commisure by a dark cross-streak.............1 *vitiensis*
4a Tegmen with the dark stripe connected with the commisure by a dark cross streak .................... *nesogonias*

### 1. *vitiensis.*

Pl. XIX, figs. 12-14.*

Mr. Muir has taken specimens (measuring up to 6 mill. long) in Fiji, Suva (No. 110), arboreal.

### 2. *nesogonias*, sp. nov.

Head and pronotum creamy, a little darker laterally. Scutellum dark blackish-brown, sometimes paler medianly. Tegmina milky, a broad, blackish-brown stripe down the tegmen, forking close to the base, also broadly touching the sutural margin at the middle and at the apical part. Wings milky, veins dark. Legs pale, apices of segments blackish.

Length 5 mill.

Hab. Fiji, Rewa, (Mar., Apr., Nov., Muir).

### 3. *nesodreptias* sp. nov.

Head and middle fourth (longitudinally) of pronotum, legs, sternites, &c., yellowish white, sterna tinged with orange. Rest of pronotum and the scutellum orange-red. Tegmina yellowish-white, with an orange-red stripe much as in *P. nesogonias*, the veins on this part being blood-red.

---

* On Pl. 19 f. 12, the sublateral keels of the vertex are not clearly shown.

Length 5 mill.

Hab. Fiji, Rewa (Mar. & Nov., Muir).

*Var*: The orange on the tegmina narrower and bordered exteriorly with smoky, or almost replaced by it. Pronotum with two blackish-brown spots and scutellum with two to four anterolaterally. The orange hue may be crimson.

### 4. *miltodias* sp. nov.

Pl. XIX, fig. 20.

Whitish yellow, pronotum laterally, scutellum (except sometimes medianly), orange-sanguineous. Pattern of tegmina as in *P. nesogonias*, but the colouring different, the blackish being replaced by orange sanguineous. Legs yellowish-white, apices very narrowly dark.

Length 4-4½ mill.

Hab. Fiji, Rewa (Mar. & Apr., Muir No. 137), arboreal.

The sulcate median part of the vertex is not shown.

### 5. *pullatus* sp. nov.

Head and pronotum brownish-yellow; vertex sordid, lateral margins very narrowly dark fuscous. Scutellum piceous. Tegmina piceofuscous, basally opaque, subcostal cell (except basally) yellowish, apical margin very narrowly sanguineous. Wings smoky hyaline, veins dark. Forelegs dark fuscous, the others brownish-yellow.

Length 6 mill.

Hab. Fiji, Rewa (Mar. Muir's Nos. 128 and 132), aboreal.

### 6. *minyrias* sp. nov.

Head pale fuscous of various tints, pronotum whitish; sterna and legs soiled whitish; scutellum orange fuscous, with 3 large brown wedges. Tegmina milky, the veins thickly blackish-brown, except the whitish basal two thirds of the subcostal cell.

Length 5½ mill.

Hab. Fiji, Rewa (Apr.).

### *Thyrocephalus.*

#### 1. *leucopterus.*

Pl. XVIII, fig. 8.

(See also text fig. 2 on p. 166).

### *Lamenia.*

In my last memoir, I placed this doubtingly among the Cixiinae; it should however, I think. be placed here, although somewhat aberrant.

### *Rhotana.*

I now add a Fijian species, which may be distinguished from the Australian forms as follows:

1 Veins of tegmina pale yellow (*) ............. 1 *chrysonoe*
1a Veins sanguineous ................................ (2)
2 Tegmina largely dark smoky .............. 3 *haematoneura*
2a Tegmina hyaline .......................... 3 *halosydne*

#### 3. *halosydne* sp. nov.

Similar in structure to the two previous species. Whitish testaceous. Eyes brownish. Tegmina hyaline testaceous, immaculate, veins on basal fourth pale, on the rest bright sanguineous. Wings hyaline, veins sanguineous.

Length 5⅛ mill.

Hab. Fiji,, Rewa (Apr.. M.).

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[*] Since this was in proof, Distant has published descriptions of five species as new, all apparently allied to *chrysonoe*, but as the length of the head is not stated, they cannot be determined without seeing the types. They are as follows: *tomentosa* p 409, *transversa*, p. 410, *opalina*, p. 410, *septemmaculata* p. 410, and *quadrimaculata* p. 411.

### *Levu.*

### 1. *vitiensis.*

Add: Fiji, Rewa (Mar., Apr., Dec., M.).

### *Xiphadodite*, gen. nov.

Allied to *Pyrrhoneura* but differs by the form of the antennae. Also somewhat similar to *Heronax*, but differs by the form of the antennae.

Lateral margins of vertex widely separated at the base, converging anteriorly, forming an acute angle. Frontal keels almost contiguous throughout, except just at their apices. *Clypeus basally wide*, extending laterally as far as, or farther than, the outside part of the antennal insertion. Antennae elongate, extending nearly as far as the head anteriorly, flattened and compressed, elongate oval in profile; head in profile extending anteriorly nearly twice as far as an eye's length. Tegmina not unlike those of *Heronax*, but obtuse-angularly produced beyond the clavus, somewhat as in *Lyricen*. Type *insulicola*.

### 1. *insulicola* sp. nov.

Yellowish-testaceous, paler beneath. Eyes greyish-black. Last segment of labium and the metanotum greyish fuscous. Tegmina subhyaline, yellowish testaceous, veins in part tinged with pale oranged. Apical cells partly faint smoky, and a few scattered fuscous spots on the rest of the tegmina. Labium reaching to about the middle of the abdomen.

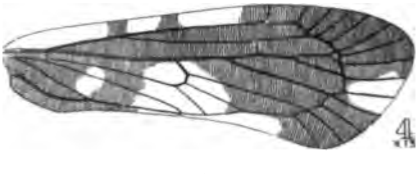
Length 7½ mill.

Hab. Viti Levu, (Mar. Muir's No. 130), arboreal.

### *Pyrrhoneura.*

*Pyrrhoneura* Kirkaldy 1906.
*Makula* Distant, op c., 408.

### 1. *saccharicida.*



(fig. annexed, of tegmen, No. 4).

Add: Fiji, Rewa (Mar., Apr., Nov., Dec., Muir's No. 48) "common on certain native trees in the Bush and at times very common on Sugar Cane, turning the leaves yellow in streaks where they feed."

The stridulatory area is figured on Pl. XX, figs. 6-7.

### 2. *citharista* sp. nov.

The lateral margins of the vertex are rather more widely reflexed than in the type species. Testaceous, posterior angle of scutellum brown, genae partly suffusedly with rosy. Tegmina cinereotestaceous, veins concolorous, two transverse bands of grey-brown, at their base and on the basal third, the latter dividing into two at the radial vein, the lower branch (which is actually a spot on the subcostal cell) curving apical-wards and dividing into two bands which proceed irregularly to the apical parts of the tegmen. Wings hyaline, veins partly fuscous, a longitudinal fuscous stripe on the apical third near the middle.

Length 5 mill. to apex of closed tegmina.

Hab. Fiji, (March, Muir's No. 106,) arboreal.

The stridulatory area is figured on Pl. XX, figs. 1-2.

### 3. *ornata.*

*Makula ornata* Distant, l. c., fig. 5.

Hab. Queensland.

This differs from the preceding two species by having apparently a few more veins at the lower apical part, and usually in the Vitian forms, there is a cross vein in the first wing cell, but this is sometimes absent in *P. citharista*. The eyes are also a little farther from the dorsal margin of the genae in *P. ornata*.

### *Nesoneura* subgenus nov.

Close to typical *Pyrrhoneura*, but the eyes are placed more as in *P. ornata* and the head in profile is subangulate anteriorly, while it is distinctly more elongate dorsally, being medianly extended farther in front of the eyes than with them.

### 4. *vitiensis* sp. nov.

Testaceous; the eyes and a small spot on each frontal keel at its base and the same at its apex, sides of pronotum narrowly, basal half of subcostal cell, blackish. Tegminal veins white, an oblique, very obtusely angulate, band across the outer half of the apical half, part of the apical margin apical of the claval apex, and some obscure elongate spots more in the centre of the tegmen, fuscous.

Length 4¾ mill. to apex of closed tegmina.

Hab. Viti Levu, Rewa (Apr., M.).

### *Nesocore,* gen. nov.

Superficially somewhat like *Phaciocephalus* but the antennae are more elongate, obliquely subtruncate apically, and the lateral keels of the frons continue sharply to the apical margin.

From *Pyrrhoneura* it differs (as also from other genera) principally by the possession of what appears to be a small, subrotundate laminate appendix to the genae, on each side, roughly at right angles to the genae themselves.

### 1. *fidicina* sp. nov.

Testaceous; the vertex with a pink tinge, lateral margins of frontal keels dark at least basally; lateral margins of nota, the abdomen above basally, &c., pale fuscous. Genal lamina milky white. Tegmina hyaline, a pale fuscous streak along the interior half, a conspicuous blackish speck near the apex, apical margin narrowly dark, part of some of the veins near the apex sanguineous. Wings milky hyaline, some of the veins fuscous.

Length 6 mill.

Hab. Viti Levu, Rewa (Mar., Apr., Muir's Nos. 151-4), under bark of an old tree much attacked by fungus.

*Nymphs* dark fuscous, the legs and sensory organs paler.

(Pl. XVIII, figs. 9-10).

### *Vivaha.*

*Vivaha* Distant 1906 Faun. Ind. Rhynch. III 395, fig. 148.

### 1. *saniosa.*

*V. saniosa* Dist., 1907 A. M. N. H. (7) XIX 405.

Hab. Queensland.

### *Ly* . nov.

Vertex elongate, narr oduced in f
posterior margin scarce to the an

eyes, apically narrowly truncate, longitudinally impressed, keeled medianly somewhat feebly: the head not impressed at the junction of vertex and frons and so separating them. Frons elongate, longitudinally impressed, basally constricted, apically truncate. Antennae short, subcylindric, subbifid apically, surrounded by a lobe of the pronotum. Pronotum deeply angulately emarginate in the middle; scutellum elongate, diamond-shaped. Tegmina elongate, apically ampliated and rounded.

### 1. *imthurni* sp. nov.

Pls. XIX, figs. 1-3 and Pl. XX, figs. 3 5.

Fuscous, grading to blackish in parts especially on the basal two-thirds of the scutellum; keels, foliaceous part of pronotum, &c., pale brownish-yellow. Scutellum with a yellowish line down the middle, broadening a little at the posterior angle. Legs testaceous, fore and middle femora faintly fuscous apically, hind femora faintly fuscous, annulated with testaceous; fore and middle tibiae fuscous apically. Abdomen dark fuscous, marked with sanguineous and testaceous. Tegmina cinereo-testaceous, veins concolorous, margined irregularly with fuscous, some of the apical cells mostly fuscous, apical [illegible] narrowly blood-red

Length of body 4 mill. [illegible] tegmina 9 mill., widest breadth of tegmen 5 mill. [illegible] 3 mill.

Hab. Viti Levu, [illegible] M.).

The male genitalia are [illegible] figs. 1-3.

In accordance with a [illegible] Muir, I name this interesting form after [illegible] im Thurn, Governor of Fiji, a zealous [illegible] traveller, who afford[illegible] Mr. Muir great [illegible] him much kindness during his researches in the [illegible]

### Synonymy

= [illegible] XXVII 279

= [illegible] Notes W. p. 1

= [illegible] S. P. N. I. 426

= [illegible] Rh. III 205, (not West-

[illegible] the type of *Phenice*, but the [illegible] aware that Westwood con[illegible] genus should as a rule be the type, but he explicity stated that this was only the case when other reasons were absent (*). Now, *Derbe fritillaris* Boh. is the first species described, but *D. fasciolata* is figured and the ***figures taken as the basis of the generic description.*** I therefore maintain that *fasciolata* is the type of *Phenice* and it certainly not a *Phenice* in a Distantian sense.

### 1. *lumholtzi* Kirkaldy.

Pl. XIX, figs. 6-8.

*Sardis maculosa* Kirkaldy 1906 Pl. 28, figs. 4-6 (not *Phenice maculosa* Krueger)[**]

*Proutista lumholtzi* Kirkaldy 1907 A. S. E. Belg., LI. 126.

Head and pronotum testaceous, a speck at the base of the frons and another on the clypeus, and some suffusions apically on the pronotum, blackish brown. Mesonotum castaneous; a median keel, a rough W in the middle, and the hind margin medianly, testaceous. Metanotum dark, whitish medianly. Legs testaceous; fore coxae, apex of tibiae, &c., blackish. Abdomen testaceous and blackish confused. Tegmina hyaline, marked with blackish brown less closely than in *moesta*.

Length 7½, expanse of tegmina 15 mill.

Hab. Queensland, Cairns (Aug., P. & K.) on *Saccharum officinarum*.

The remarkable male genitalia are figured (Pl. XIX, figs. 6-8).

### 2. *australis*.

*Phenice australis* Distant, op. c., 397.

Hab. Queensland. Unknown to me.

### *Nesoniphas*, gen. nov.

Vertex and pronotum raised and swollen vertically, the lateral margins of the vertex (as seen dorsally) rounded and apically produced linearly between and beyond the eyes which are very large. Frons linear, narrowly channelled medianly, widened and

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[*] "I do not here insist upon the necessity of placing a typical species at the head of a genus.........but I do insist that where an author does not state the particular species which he regards as the type of his genus, we are bound to suppose that he would place it at the head of his genus." Westwood, April 1837 Mag. Nat. Hist. n. s., I, 170.

[**] Through the courtesy of Dr. Van Deventer, I have examined some Javanese examples of *Proutista moesta* (=*maculosa*), a species different from the Australian one. The stridulating area of *moesta* is figured on Pl. XX, figs. 8-9.

flattened apically. Antennae very short. In profile the head and pronotum are about equally raised but there is a deep cleft between the two down to their meeting place. Pronotum posteriorly emarginate in the middle, scutellum flat, not carinate.

1. *insignissima* sp. nov.

Pl. XIX, figs. 10-11.

Whitish testaceous, whiter above; frons margined with fuscous. Ocellus black. Eye dorsally with an interior black line which is continued on to the pronotum laterally. Tegmina milky hyaline, a dark fuscous line on the basal half of the subcostal vein, the tegmina also spotted elongately with greyish, veins white. Wings white, veins concolorous.

Length 5 mill.

Hab. Viti Levu, (Muir No. 55), Rewa Mar.-Dec.), on *Zingiber zerumbet* (wild ginger).

*Philadelphcia.*

1. *pandani.*

The male genitalia are figured Pl. XIX, fig. 9.

*Muiria* gen. nov.

Distinguished from other *Derbidae* by the rudimentary wings. Head and pronotum vertical, vertex very small, triangular, and produced linearly anteriorly, projecting well beyond anterior margin of eyes, the latter being subcontiguous at about half their length. Frons linear, acute. Antennae elongate, first segment subannulate but prominent, second four times as long as maximum width, about equal in length to the fore femora, obliquely truncate apically, the flagellum arising at the short end of the truncation. Pronotum very narrow, deeply emarginate angularly. Scutellum rather feebly tricarinate.

1. *stridula* sp. nov.

Pl. XIX, f. 4-5 and Pl. XX, figs. 10-13.

Sanguineous; legs and genital segments (in part) paler; antennae testaceous. Tegmina hyaline, veins pale fuscous, costal and subcostal veins, apical margin, &c., sanguineous.

Length of body 2 mill., to apex to tegmen 5½ mill.

Hab. Viti Levu, Rewa (Mar., Muir's No. 159), off a low, native palm.

I have much pleasure in naming this remarkable genus after my friend Mr. Muir. His interesting remarks on the stridulation will be found on p. 7.

Pl. XX, fig. 13 does not depict the vertex quite accurately being too broad basally and not excavated. The scutellum of the mesonotum should be represented as feebly tricarinate.

### *Heronax* Kirkaldy.

=*Fennahala* Distant, op. c., 412.

#### 1. *parnassius.*

*H. parnassius* Kirkaldy.
*F. infuscata* Dist., l. c., fig. 6.

I think this synonymy is correct.

#### 2. *rubrinervis.*

*F. rubrinervis* Dist., op. c., 413.
Hab. Queensland, Cairns.

#### 3. *saccharivora.*

*H. saccharivora* Kirkaldy.

#### 4. *juno.*

*F. juno* Dist., l. c.
Hab. Queensland, Kuranda.

This is evidently very close to *saccharivora*, but the colouring, as mentioned by Distant, seems a little different.

#### 5. *pallescens.*

*F. pallescens* Dist., l. c.
Hab. Queensland.

### *Phantasmatocera.*

*Phantasmatocera* Kirkaldy.
=*Arunta Distant,* op. c., 406.

#### 1. *arborea.*

*P. arborea* Kirkaldy.
*A. rubrovenosa* Distant, l. c., fig. 3.

Distant has led himself astray by not noticing that it was not the generic type that was figured, but a second species, which in fact is not congeneric.

### *Nesophantasma* gen. nov.

Differs from *Phantasmatocera* by the shorter head, whose lateral margins are only slightly sinuate, and by other structures well seen in the respective figures; by the shorter antennae which do not reach in profile to the apex of the eyes; the tegmina more rounded at the apex, and the apical areas larger and less in number. Type *vitiensis.*

#### 1. *vitiensis.*

*Phantasmatocera vitiensis* Kirk., Pl. XXVIII, figs. 1-3.

### *Swezeyia.*

#### 1. *lyricen.*

Pl. XIX, figs. 15-19.

Mr. Muir has taken this in Viti Levu, Rewa (March).

### *Kuranda.*

*Kuranda Dist.,* op. c., 407.

#### 1. *notata.*

*K. notata* Dist., l. c., fig. 4.
Hab. Queensland.
Not unlike *Niphadodite* except that the antennae are very different.

## *Zoraida.*

||*Thracia* Westwood 1841 A. M. N. H., VI 478.
*Zoraida* Kirkaldy 1900 Entom., 242.

Distant has described five species as belonging to this genus, from Queensland, viz.:—

1 *cycnoptera* p. 401.
2 *eupoecila*, p. 402.
3 *consanguinea*, l. c.
4 *cydista*, l. c.
5 *picta*, p. 403.

## *Sikaiana.*

*Sikaiana* Distant, op. c., 399.

### 1. *nesiope* sp. nov.

### Pl. XVIII, fig. 13 (tegmen).

Testaceous, eyes black. Antennae fuscous. Tegmina milky, two or three sanguineous specks on the costal margin, veins concolorous, very delicately marked with fuscous. Wings milky, veins concolorous, one or two fuscous specks.

Length 1½ mill to apex of body, 4¾ mill. to apex of tegmina.

Hab. Viti Levu, Rewa (Apr., Muir No. 167; 1 example in bad condition.

It seems close to *S. hyalinata* Dist. but it is smaller, the general hue of the venation is milky-white and the tegminal pattern is different. Distant has described two Australian species, *S. hyalinata* p. 399, fig. 1., and *S. maculosa*, l. c., Queensland.

# DESCRIPTION OF PLATES.

## Plate I.

1. *Cicadetta tympanistria.*
2. Male genitalia of the same, in profile.
3. Operculum of the same.
4. *Philagra parva,* wing, (a little diagrammatic).
5. *Polychaetophyes serpulidia,* wing (do.).
6. *Dialectopteryx australica,* wing (the dotted lines show the restored parts).
7. The same, tegmen (do.).
8. *Astorga saccharicida,* nymph.
9. The same in profile.
10. *Muirella oxyomma,* nymph.
11. The same in profile.
12. Face of the same.
13. *Conosanus hospes,* nymph.
14. Long-winged adult of the same.
15. Short-winged adult.
16. Tegmen of long-winged form.
17. Tegmen of short-winged form.

## Plate II.

1. *Idiocerus hyleorais,* vertex.
2. Face of the same.
3. *Nephotettix plebeius,* vertex &c.
4. Face of the same.
5. *N. eurytus,* vertex &c.
6. Face of the same.
7. *Eurinoscopus lentiginosus,* vertex &c.
8. Face of the same.
9. *Driotura aristarche.*
10. Face of the same.
11. *Nephotettix apicalis,* tegmen.

13. Face of the same.
14. *Tharra* sp., nymph in profile.

15. Dorsal view of the same.
16. *T. nausikaa.*
17. Face of the same.
18. *Hybrasil brani,* vertex &c.
19. *Thymbris inachis,* female.
20. Face of the same.
21. *Muirella oxyomma.*
22. Face of the same.

## Plate III.

1. *Siphanta acutipennis.*
2. *S. acuta.*
3. *S. toga.*
4. *S. acuta* (var.).

## Plate IV.

1. *Siphanta sensilis.*
2. *S. granulicollis.*
3. *S. lucindae.*
4. *S. granulata.*

## Plate V.

1. *Siphanta subgranulosa.*
2. *S. breviceps.*
3. *S. galeata.*
4. *Thanatochlamys tristis.*

## Plate VI.

1. *Siphanta acutipennis,* vertex &c.
2. Face of the same.
3. *S. galeata,* vertex &c.
4. Face of the same.
5. *S. lucindae,* vertex &c.
6. Face of the same.
7. *S. granulicollis* (var.) vertex &c.
8. Face of the same.
9. *Thanatochlamys tristis,* vertex &c.
10. Face of the same.

11. *Siphanta granulicollis*, vertex &c.
(N. B.—The median keels are omitted).
12. *S. subgranulosa*, vertex &c.
13. *S. acuta*, the same.
14. Face of the same.
15. *S. sensilis*, vertex &c.
16. Face of the same.
17. *S. acuta*, last nymphal instar.
18. Face of the same.
19. The same in profile.
20. The same, egg-mass in situ.

## Plate VII.

1. *Tylana acutipennis*, tegmen.
2. Vertex &c. of the same.
3. Face of the same.
4. *Phantiopsis australiaca*.
5. Vertex &c. of the same.
6. Face of the same.
7. Nymph of an unknown Fulgorine.
8. Face of the same.
9. *Apsadaropteryx elongatulus*.
10. Face of the same.
11. *Siphanta toga*, vertex &c.
12. *Chlamydopteryx ridicularius*, vertex &c.
13. Face of the same.
14. Tegmen of the same.
15. *C. vulturnus*.
16. Face of the same.
17. *Phaeopteryx sidnicus*, nymph.
18. Face of the same.
19. The same in profile.
20. The same, adult.
21. Face of the same.

## Plate VIII.

1. *Leptochlamys compressa*, vertex &c.
2. Face of the same.
3. *Peltodictya kurandae*

4. Face of the same.
5. *Oliarus felis*, vertex &c.
6. Face of the same.
7. *O. lubra*, vertex &c.
8. Face of the same.
9. Tegmen of the same.
10. *O. phelia*, vertex &c.
11. Face of the same.
12. Tegmen of the same.
13. *Solonaima solonaima*, vertex &c.
14. Face of the same.
15. Tegmen of the same.
16. *Australoma austrina*, vertex &c.
17. Face of the same.
18. Tegmen of the same.
19. *Leirioessa tortricomorpha*, vertex &c.
20. Face of the same.
21. Tegmen of the same.

Plate IX.

1. *Aristyllis omphale*, vertex &c.
2. Face of the same.
3. *A. aristyllis*, vertex &c.
4. Face of the same.
5. *A. adippe*, vertex &c.
6. Face of the same.
7. *Eurynomeus australiae*, vertex &c.
8. Face of the same.
9. *Basileocephalus thaumatonotus*, vertex &c.
10. Face of the same.
11. The same in profile.
12. *Rhinodictya quaesitrix*.
13. Face of the same.
14. *Suva koebelei*, vertex &c.
15. Face of the same.
16. The same in profile.
17. *Callinesia pulchra*.
18. *Francesca saleminophila*.
19. Face of the same.
20. *Callichlamys muiri*.
21. Face of the same.

## Plate X.

1. *Delphax anemonias,* vertex &c.
2. Face of the same.
3. *D. eupompe,* vertex &c.
4. Face of the same.
5. *Megamelus proserpina,* vertex &c.
6. Tegmen of the same.
7. Aberrantly veined tegmen of the same.
8. *M. sponsa,* vertex &c.
9. Face of the same.
10. *Delphax parysatis.*
11. Face of the same.
12. *D. thyestes.*
13. Face of the same.
14. *Peregrinus maidis.*
15. *D. albotristriatus.*
16. D. *algebra.*
17. Face of the same.
18. *D. dilpa* (N. B.—The vertex is too much produced).
19. Face of the same.
20. *D. astyanax.*

## Plate XI.

1. *Stenocranus agamopsyche.* vertex &c.
2. Face of the same.
3. Face of the same, nymphal instar.
4. Nymph of the same.
5. *Perkinsiella saccharicida,* face.
6. Profile of the same.
7. Antenna of the same.
8. Hind tibial and tarsus of the same.
9. *Dicranotropis koebelei,* face.
10. Hind tibia and tarsus of the same.
11. *Anectopia mandane,* brachypterous form.
12. Face of the same.
13. Profile of the same.
14. *Dicranotropis pseudomaidis.*
15. Nymph of the same.
16. Face of the same.
17. *Anectopia mandane.* macropterous form.

18. Hind tibia and tarsus of *Tetigonia parthaon.*
19. The same of *Eurymelias hyacinthus.*
20. The same of *Philagra parva.*

## Plate XII.

1. *Tropidocephala dryas,* vertex &c.
2. Face of the same.
3. The same in profile.
4. Hind leg of the same.
5. *T. eximius,* vertex &c.
6. Face of the same.
7. The same in profile.
8. *Haplodelphax iuncicola,* vertex &c.
9. Face of the same.
10. *Hadeodelphax pluto,* vertex &c.
11. Face of the same.
12. *Perkinsiella vastatrix,* male pygophor (end on).
13. The same (three-quarter view).
14. *P. sinensis,* the same (end on).
15. The same (three-quarter view).
16. *Delphax eupompe,* the same (end on).
17. The same (three-quarter view).
18. The same in profile.
19. *Megamelus proserpina,* the same (end on).
20. The same (three- quarter view).
21. The same in profile.

## Plate XIII.

Male pygophors of Asiracidae, in two or three views.

1-3. *Perkinsiella pseudomaidis.*
4-6. *Dicranotropis muiri.*
7-8. *Peregrinus maidis.*
9-10. *Perkinsiella vitiensis.*
11-13. *P. saccharicida.*
14-5. *P. graminicida.*

## Plate XIV.

The same as the preceding:

1-3. *Delphax albotristriatus.*
4-6. *Anectopia mandane.*

7-9. *Megamelus persephone.*
10-12. *Delphax albicollis.*
13-15. *D. astyanax.*

## Plate XV.

The same as the preceding:

1-3. *Delphax puella.*
4-5. *Stenocranus pacificus.*
6-8. *Purohita arundinacea.*
9-11. *Delphax kolophon.*
12-14. *D. pylaon.*
15-16. *D. algebra.*

## Plate XVI.

The same as the preceding:

1-2. *Delphax anemonias.*
3. *D. geranor.*
4-5. *D. matanitu.*
6-7. *D. dilpa.*
8-9. *D. kaha.*
10-11. *D. ostorius.*
12-13. *D.dryope.*
14-15. *Smicrotatodelphax perkinsi.*

## Plate XVII.

Of the same nature as the preceding.

1-3. *Gelastodelphax histrionicus.*
4-5. *Tropidocephala dryas.*
6-7. *Stenocranus agamopsyche.*
8-9. *Dicranotropis koebelei.*
10-11. *Hadeodelphax persephone.*
12. *H. pluto.*
13-14. *Melanesia pacifica.*
15-6. *Tropidocephala eximius.*

## Plate XVIII.

1-3. *Delphax lazulis,* male pygophor.
4. *D. disonymos,* the same.
5. *Lyricen imthurni,* profile.
6. Head and nota of the same.

7. Face of the same.
8. *Thyrocephalus leucopterus,* tegmen.
9. *Nesocore fidicina,* nymph.
10. Face of the same.
11. *Proterosydne arborea.*
12. Face of the same.
13. *Sikaiana nesiope,* tegmen.
14. *Smicrotatodelphax perkinsi.*
15. *Delphax matanitu.*
16. *Gelastodelphax histrionicus.*

## Plate XIX.

1-3. *Lyricen imthurni,* male genitalia.
4-5. *Muiria stridula,* the same.
6-8. *Proutista lumholtzi,* the female genitalia.
9. *Philadelpheia pandani,* the male genitalia
10. *Nesoniphas insignissima* head and nota.
11. The same in profile.
12. *Phaciocephalus vitiensis,* head &c.
13. Profile of the same.
14. Face of the same.
15. *Swezeyia lyricen,* head and nota.
16. Face of the same.
17. The same in profile.
18. Antenna.
19. The same enlarged.
20. *Phaciocephalus miltodias*

## Plate XX.

1. *Pyrrhoneura citharista,* wing.
2. The same, stridulatory area.
3. *Lyricen imthurni,* wing.
4. Stridulatory area of the same.
5. Variant venation of No. 3.
6. *Pyrrhoneura sacchanicida,* wing.
7. Stridulatory area of the same.
8. *Proutista moesta,* wing.
9. Stridulatory area of the same.
10. *Muiria stridula,* profile.
11. Base of flight organs in same.
12. Wing of same.
13. Dorsal view of same.

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**Tetigoniidae** 23.
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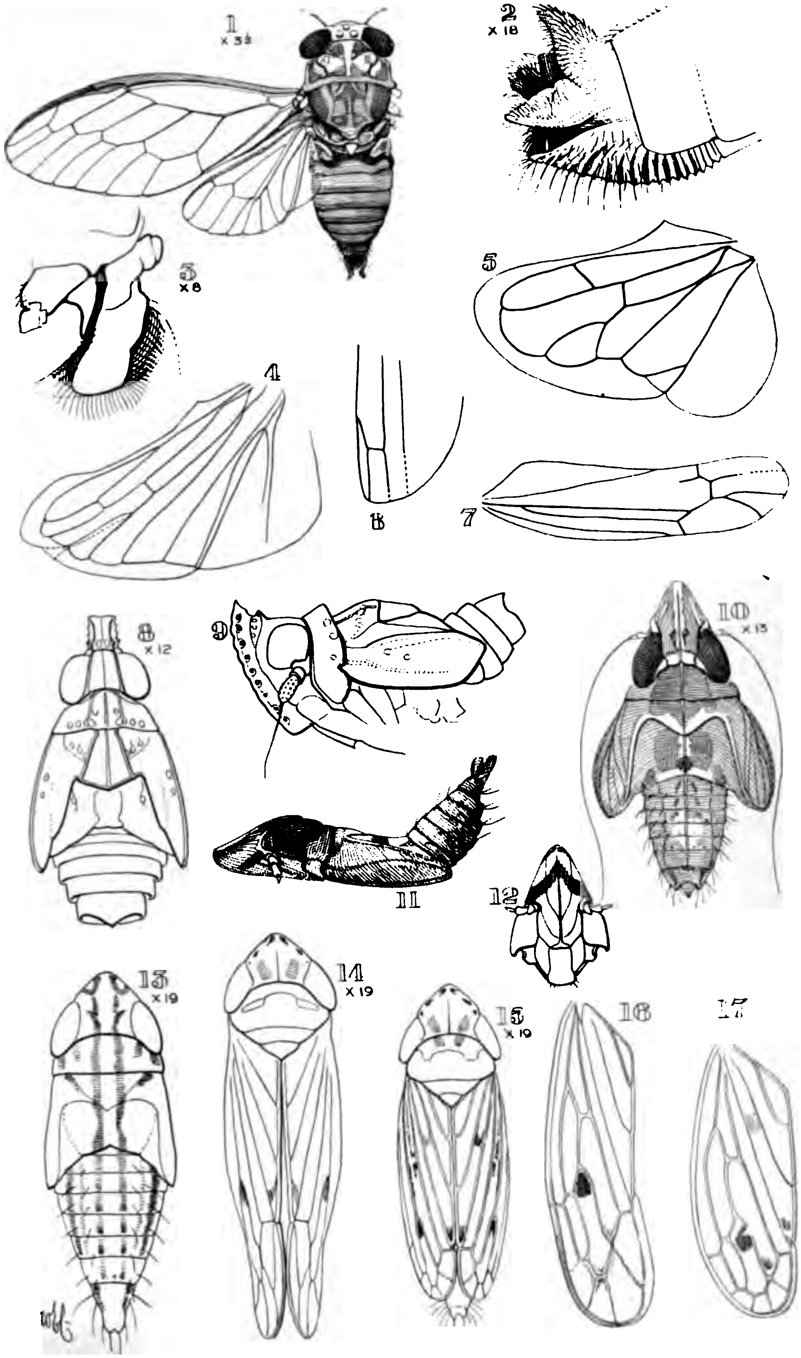

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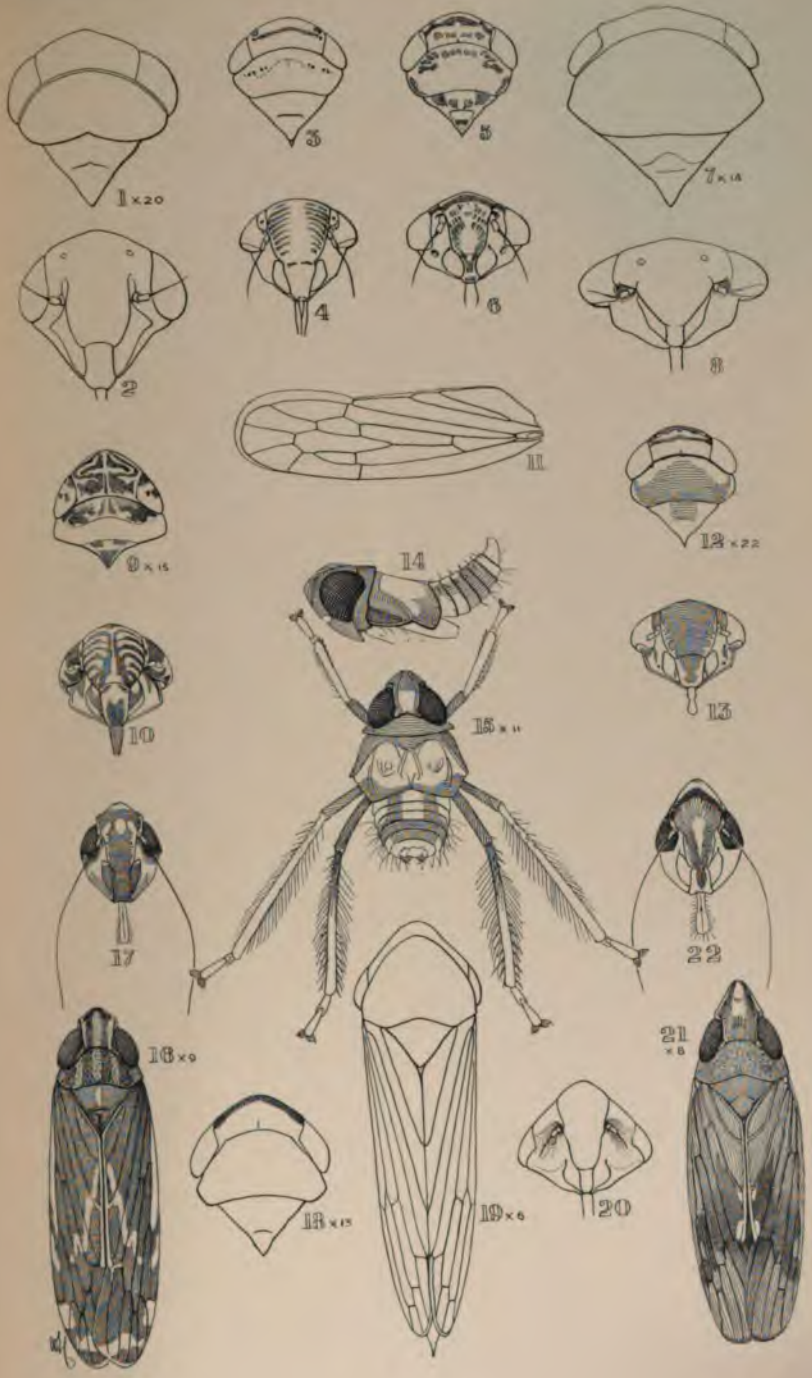
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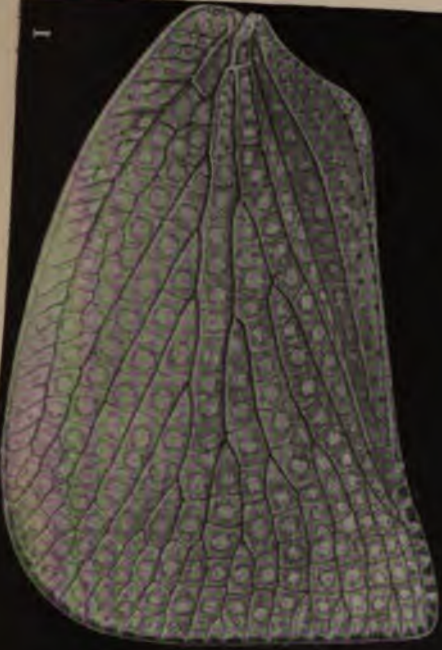

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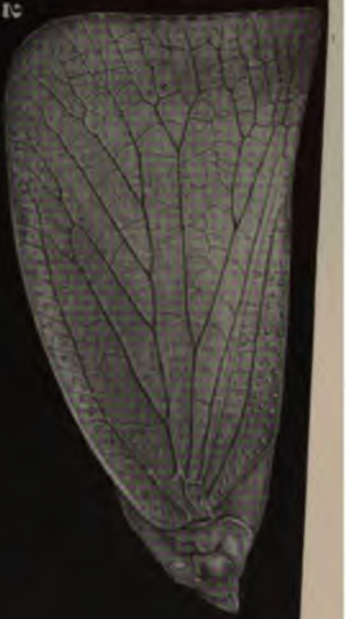

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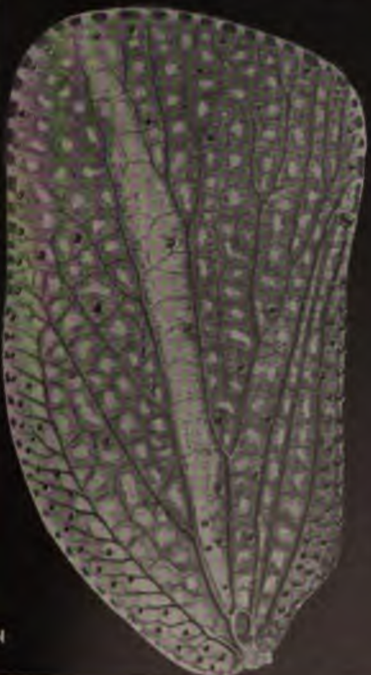

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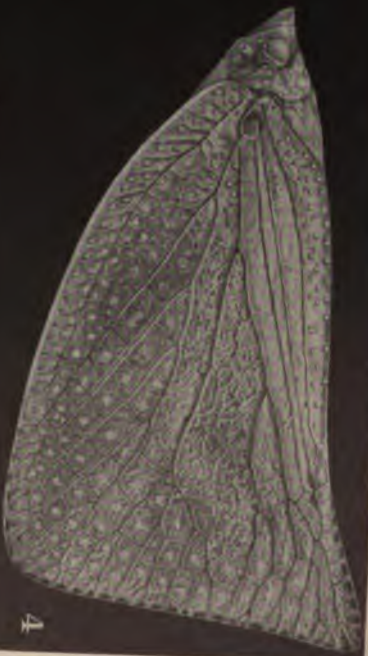

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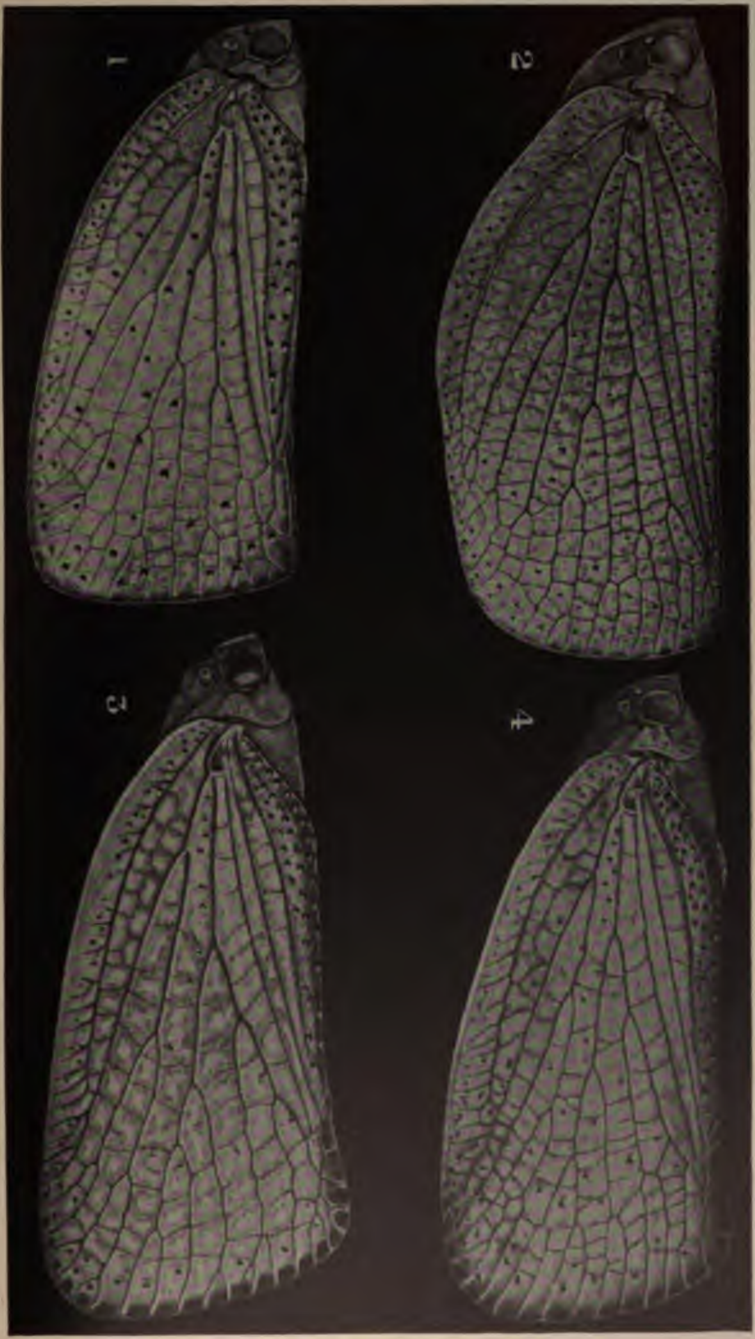

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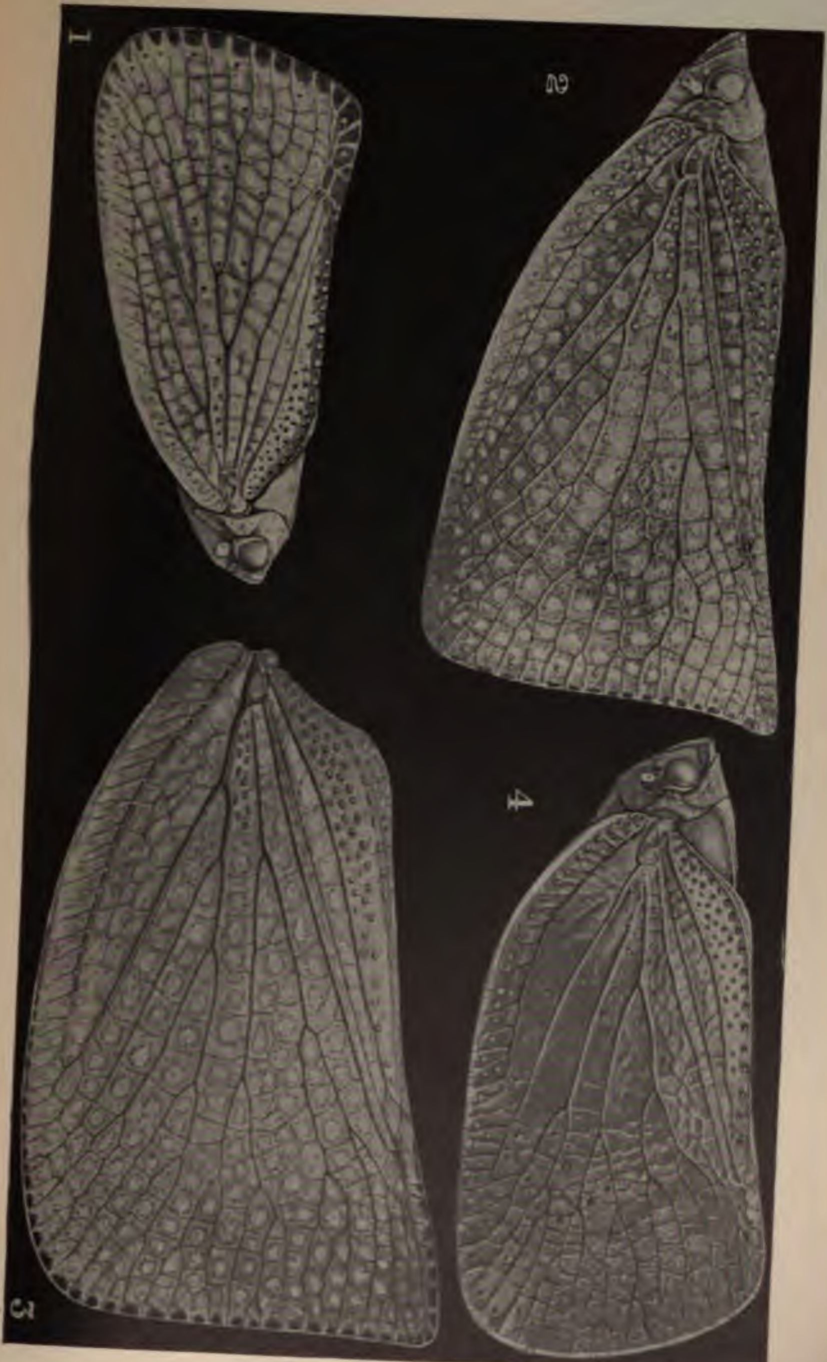

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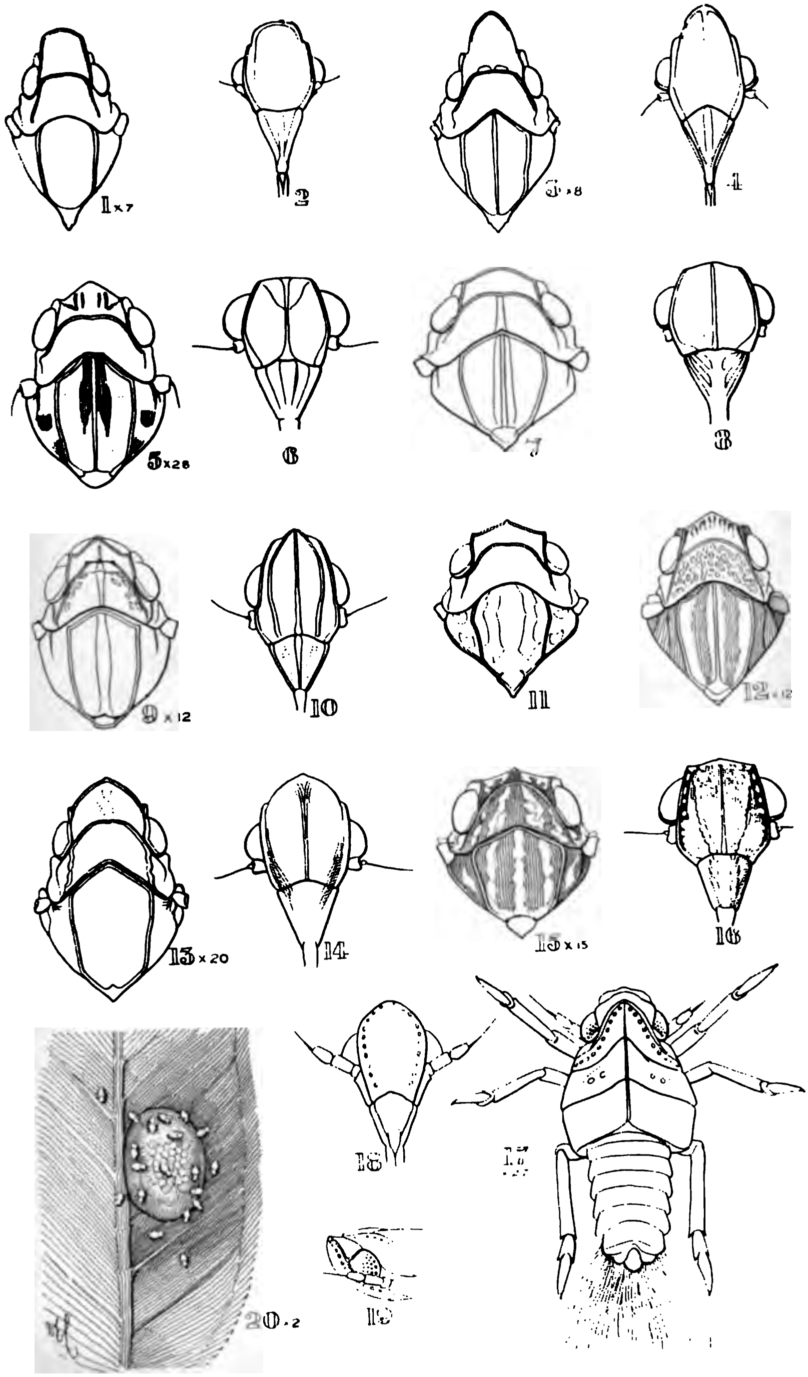
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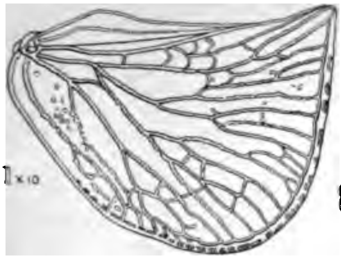
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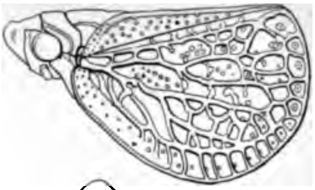
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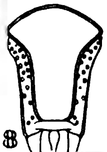
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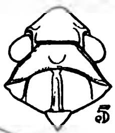
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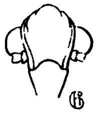
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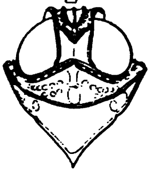
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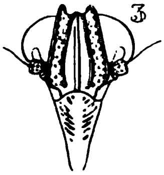
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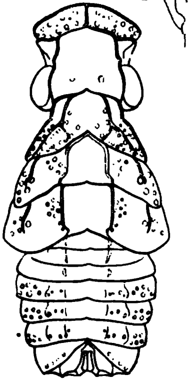
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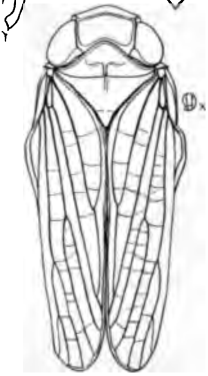
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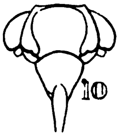
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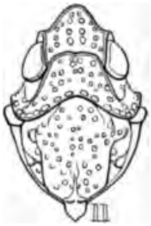
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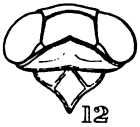
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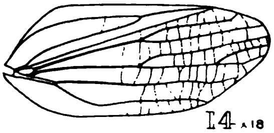
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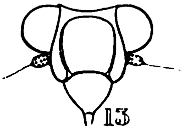
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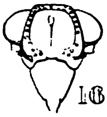
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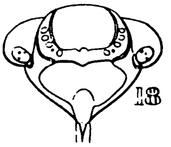
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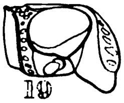
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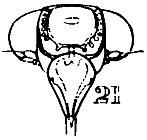
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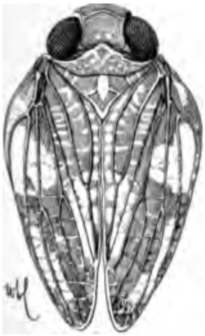
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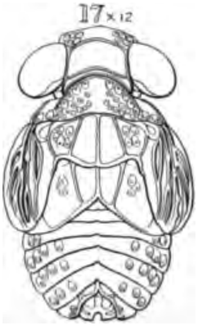
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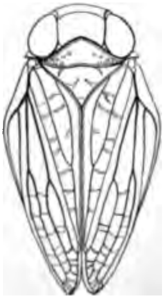
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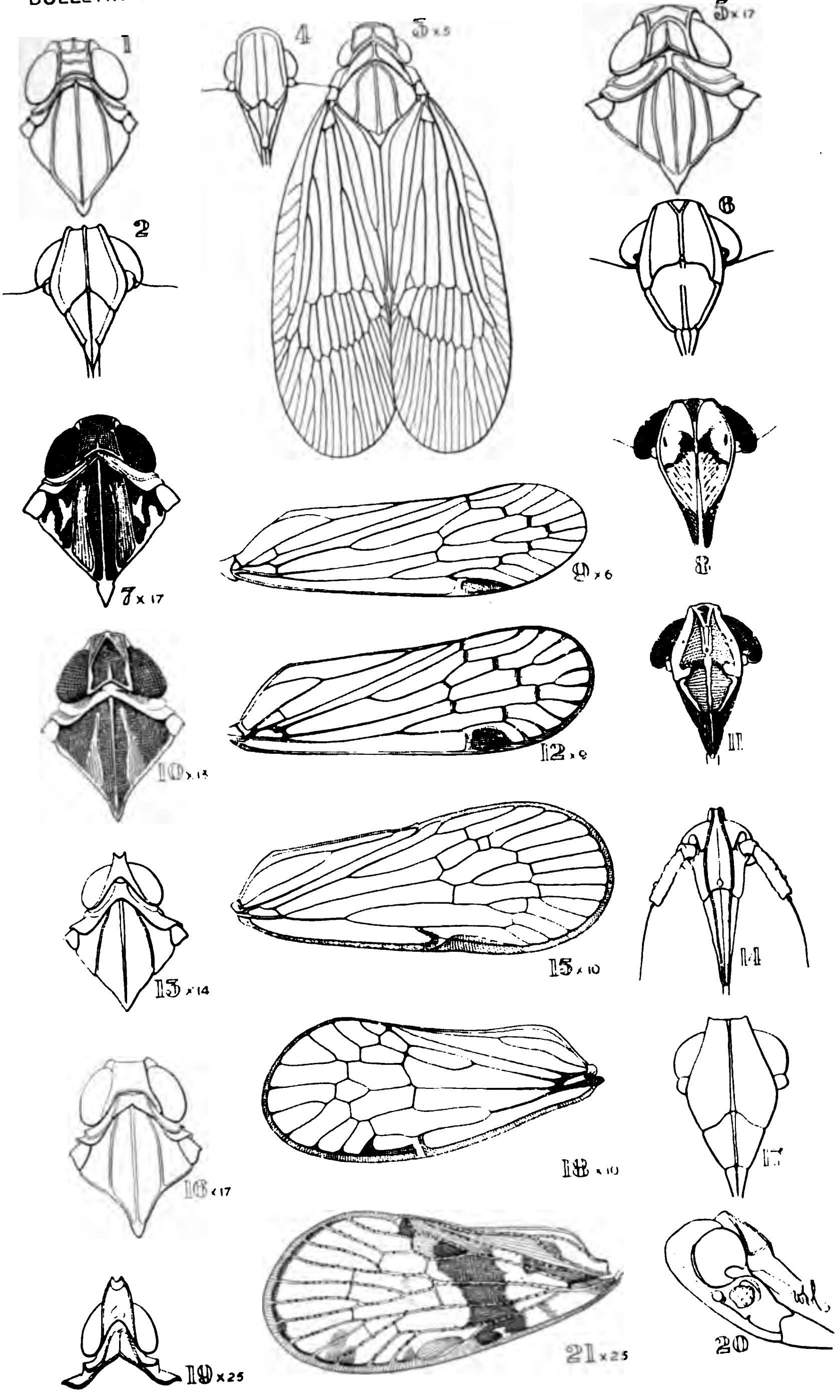
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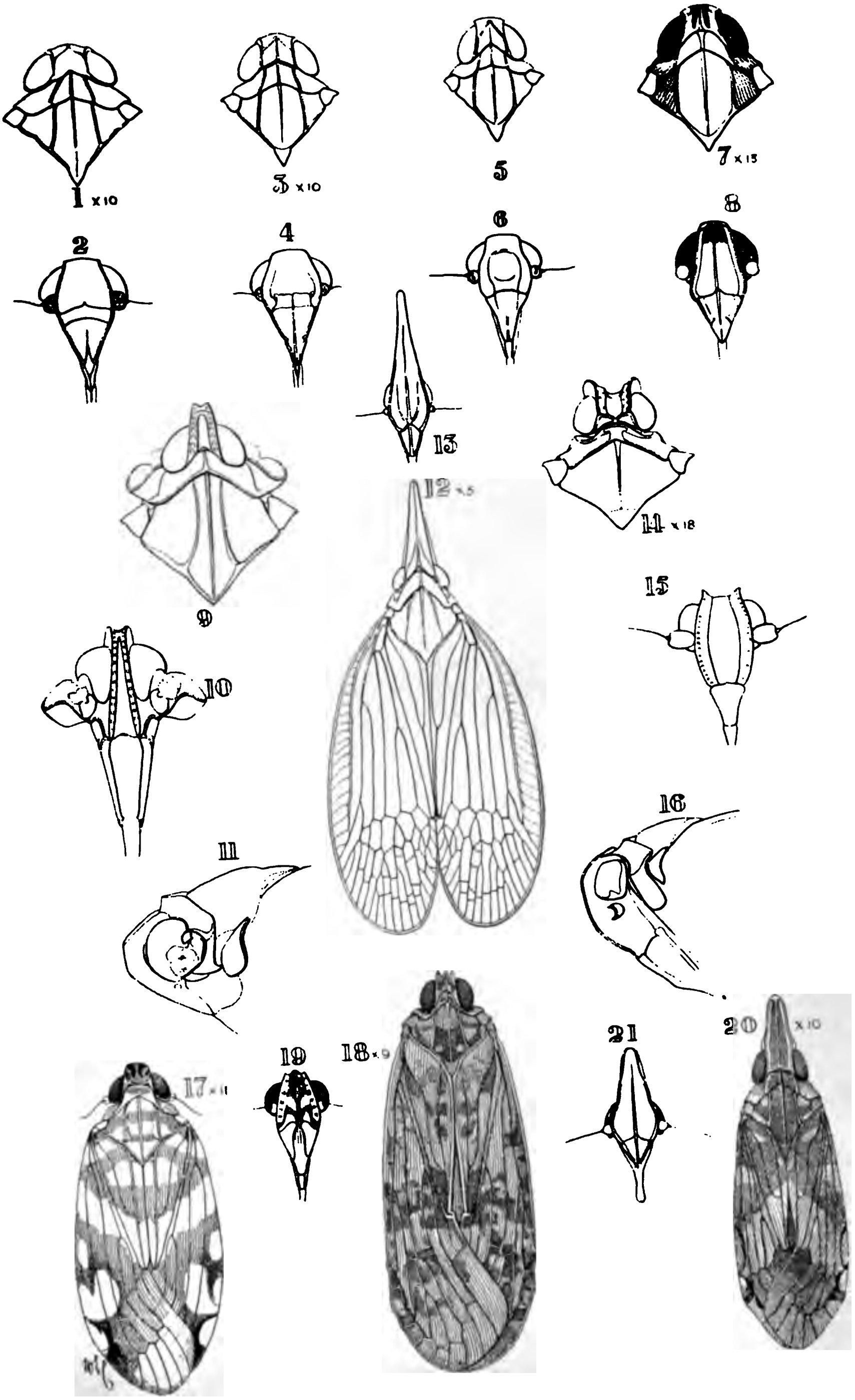
PLATE VIII.

BULLETIN III.



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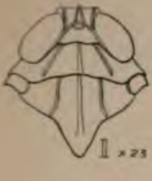
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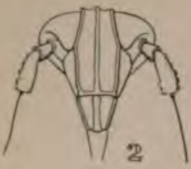
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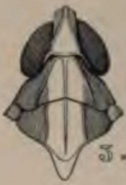
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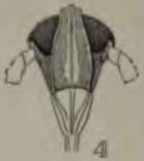
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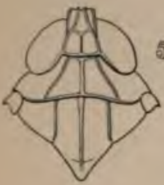
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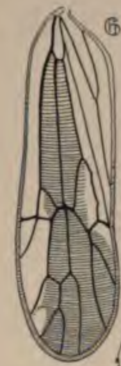
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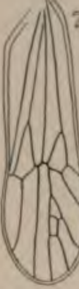
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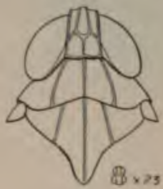
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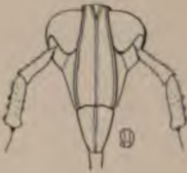
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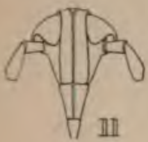
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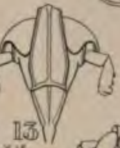
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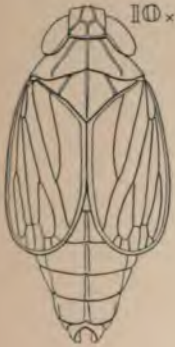
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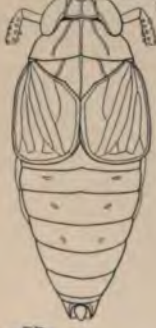
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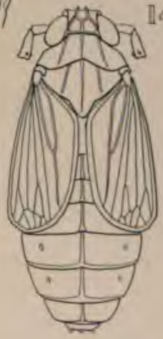
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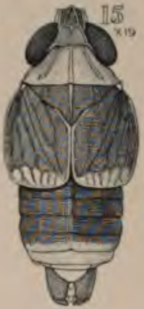
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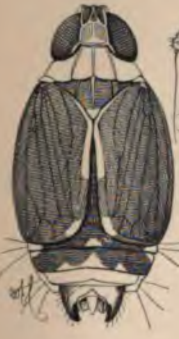
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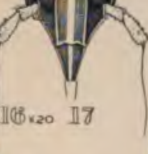
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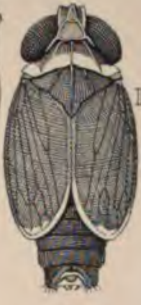
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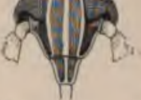
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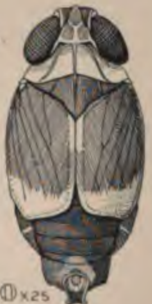
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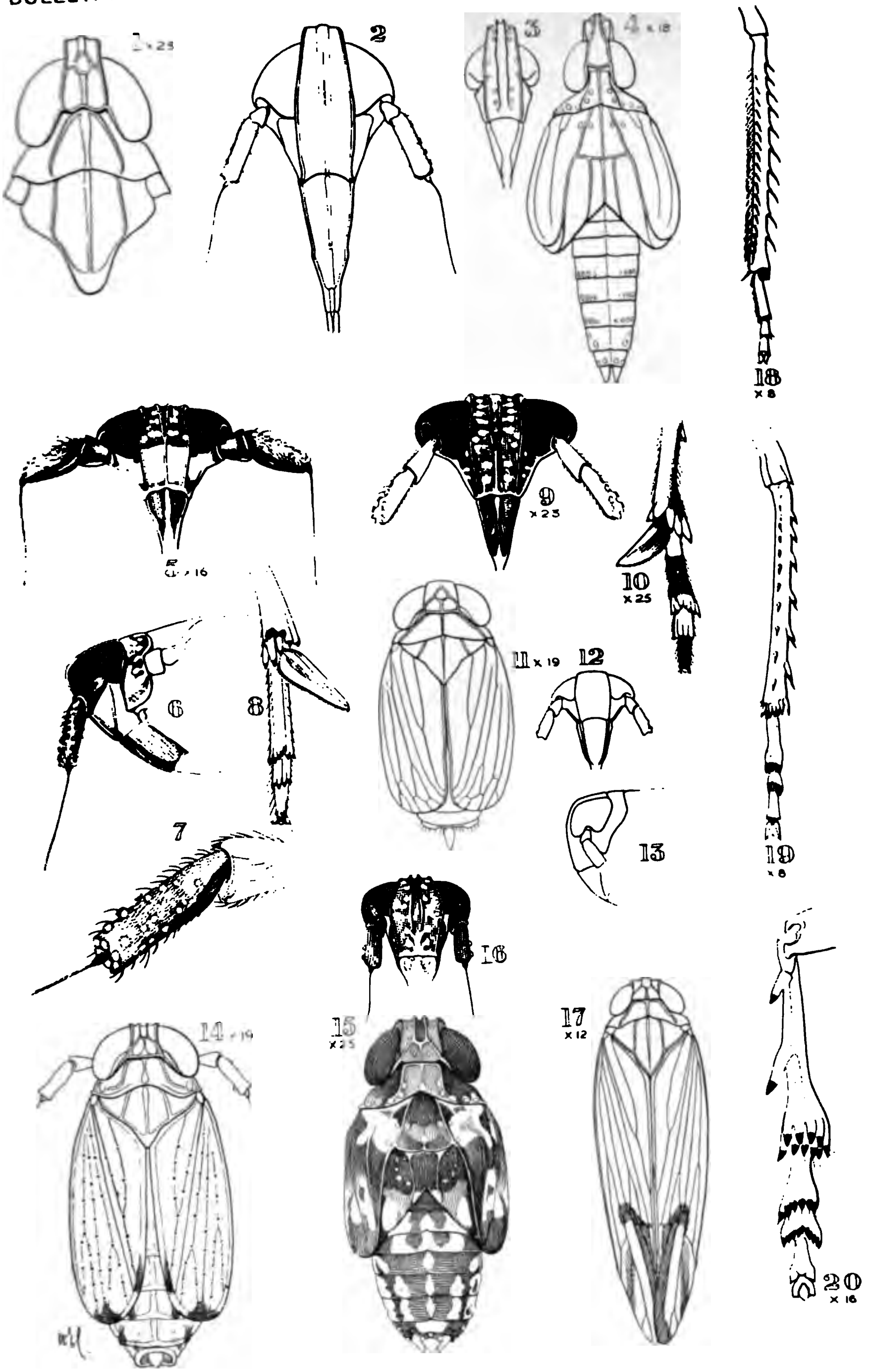
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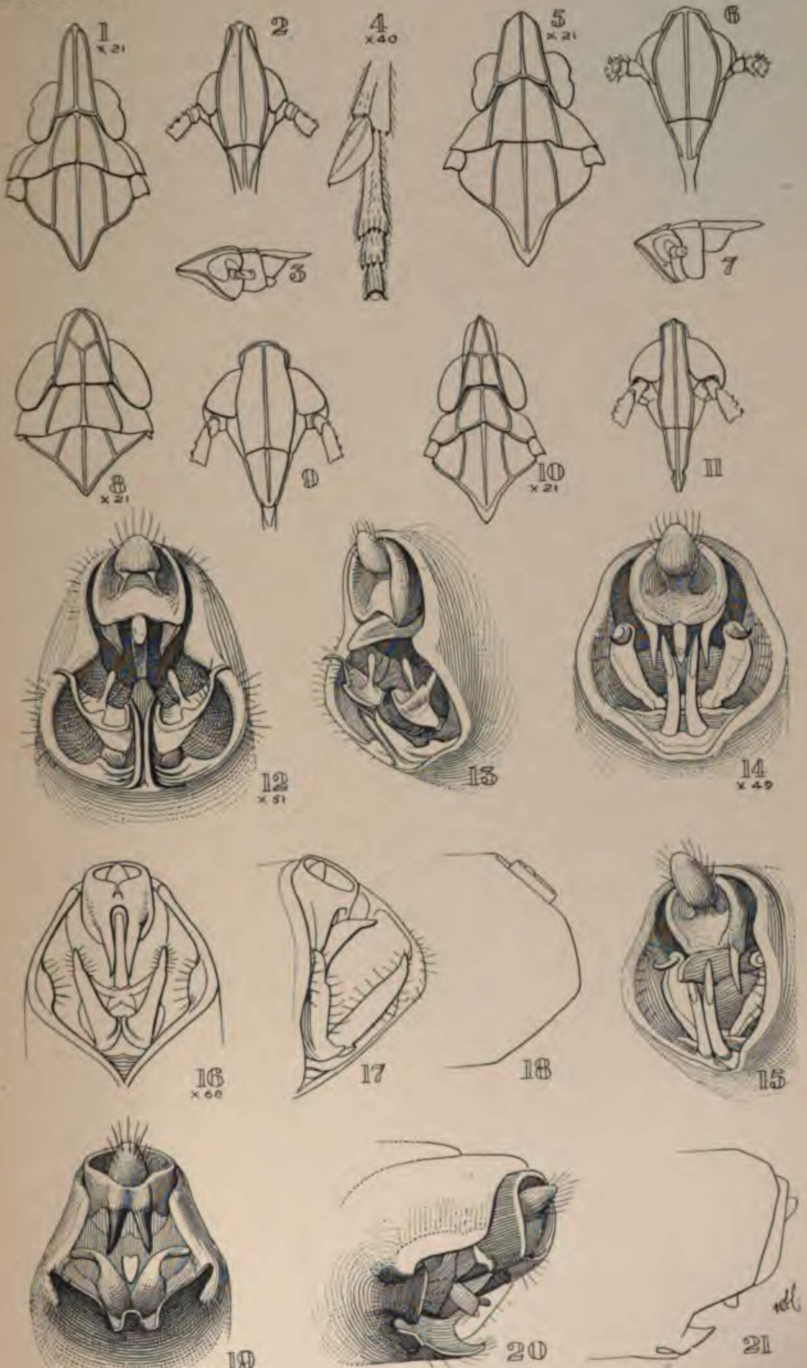
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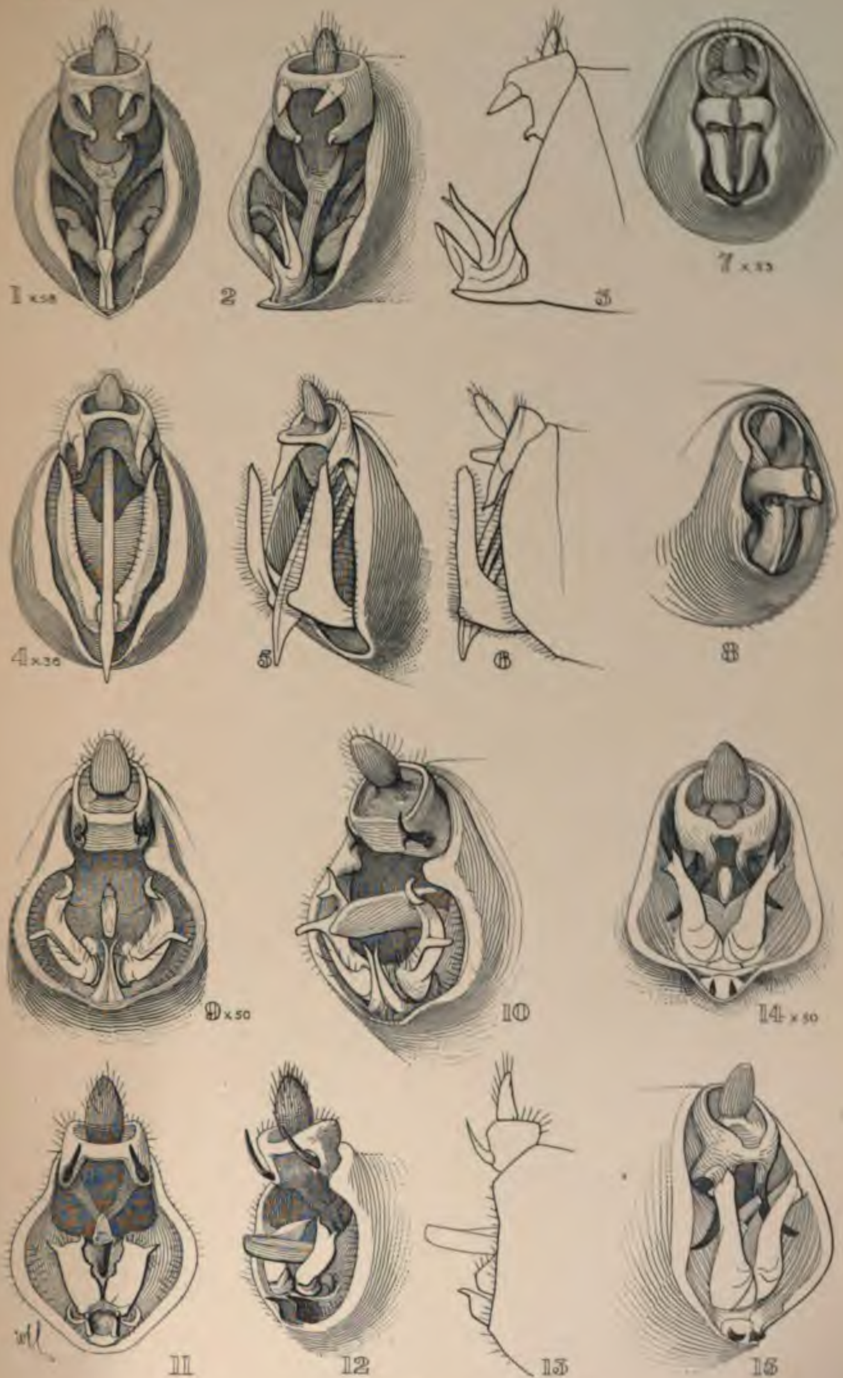

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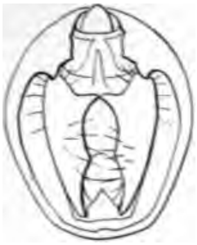
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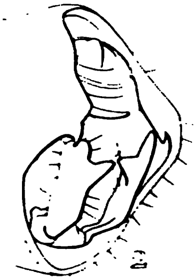
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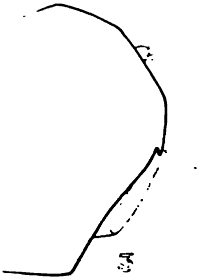
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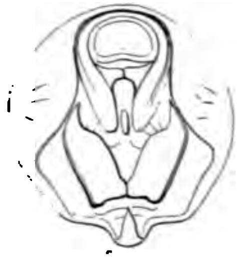
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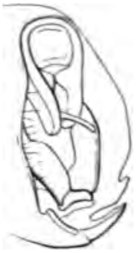
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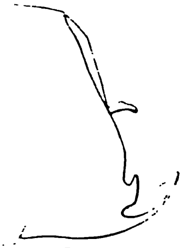
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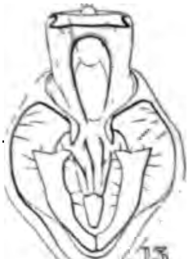
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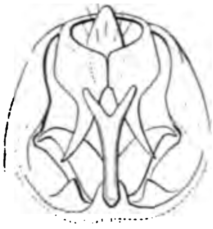
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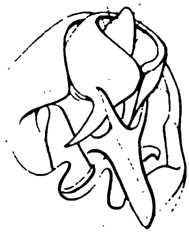
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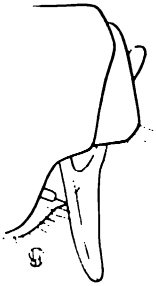
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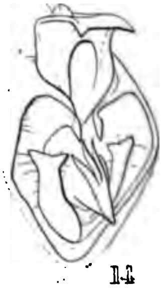
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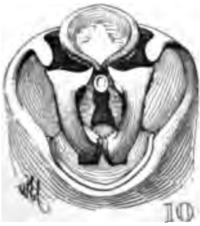
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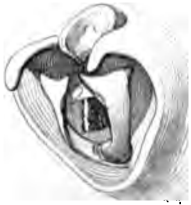
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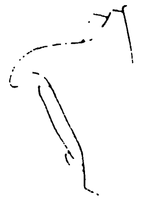
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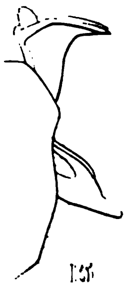
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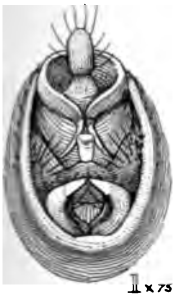
PLATE XIV.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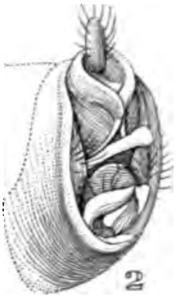
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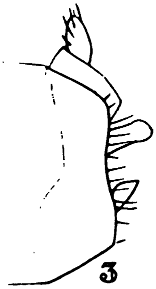
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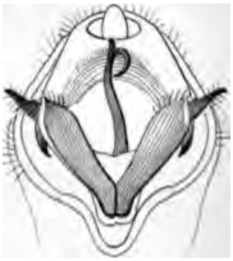
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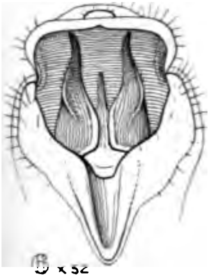
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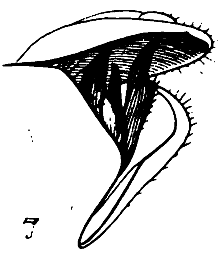
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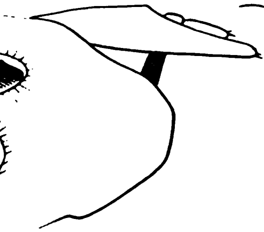
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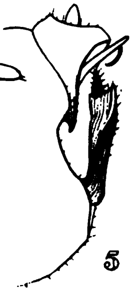
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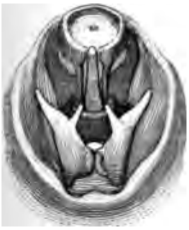
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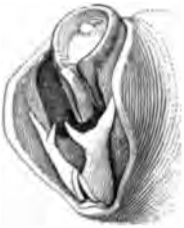
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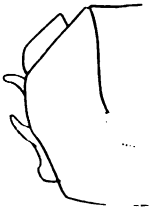
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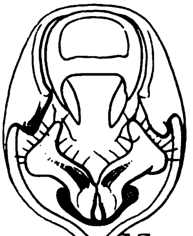
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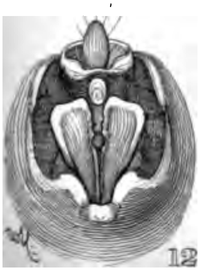
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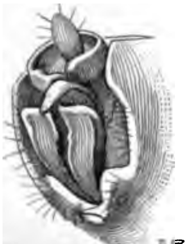
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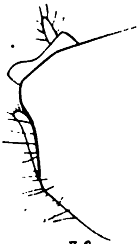
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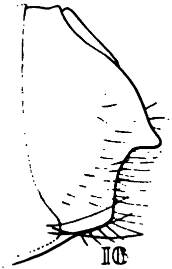
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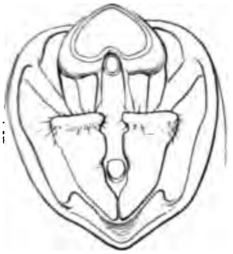
PLATE XV.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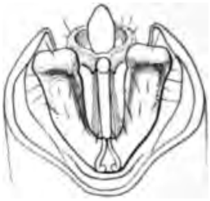
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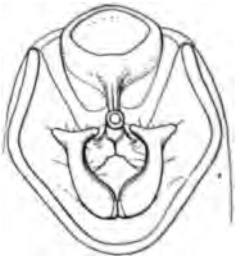
× 60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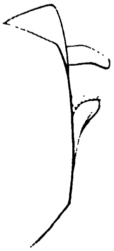
× 103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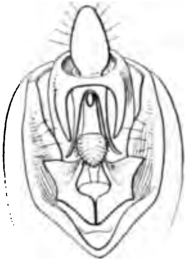
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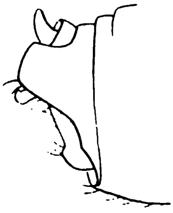
× 67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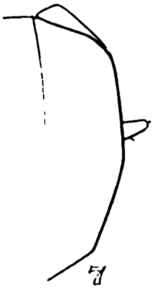
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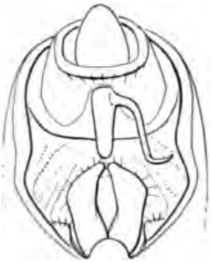
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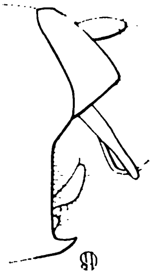
× 70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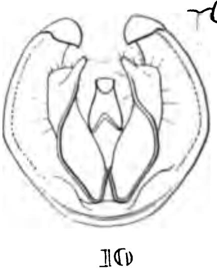
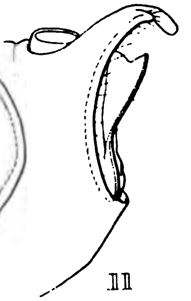

10
× 70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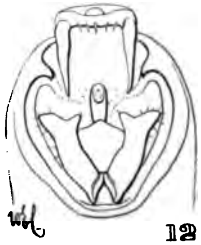
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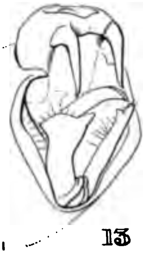
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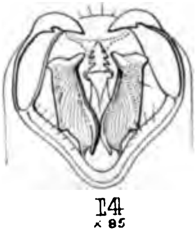
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× 85

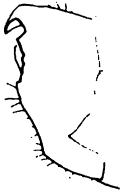
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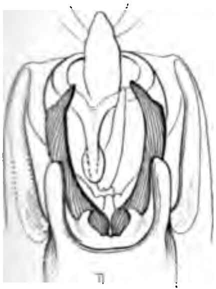
PLATE XVI.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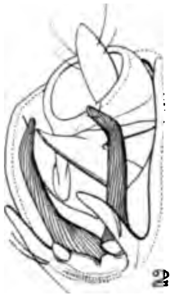
×63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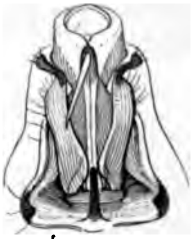
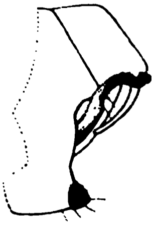

4
×63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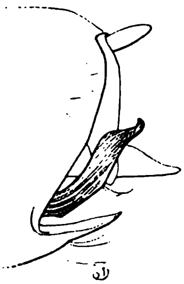
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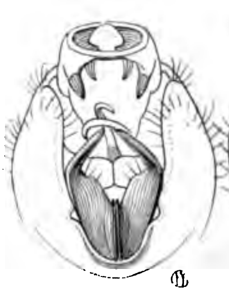
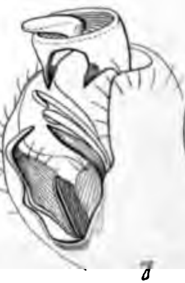

6
×53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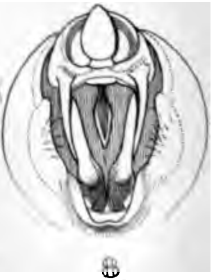
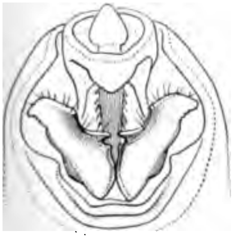

8
×63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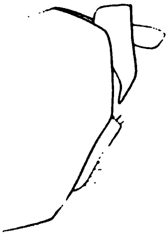
×60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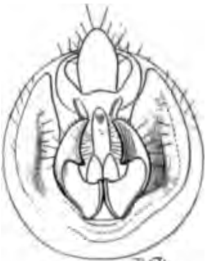
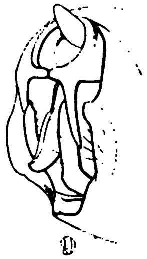

12
×67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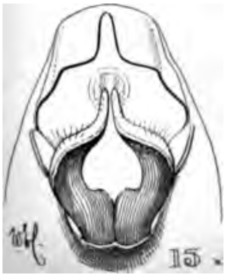
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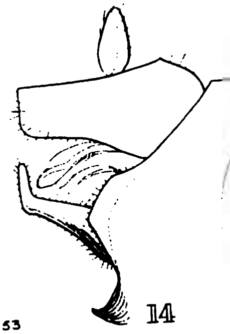
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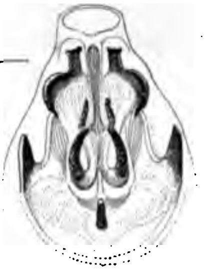
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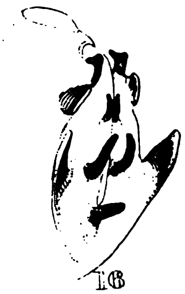
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PLATE XVII.

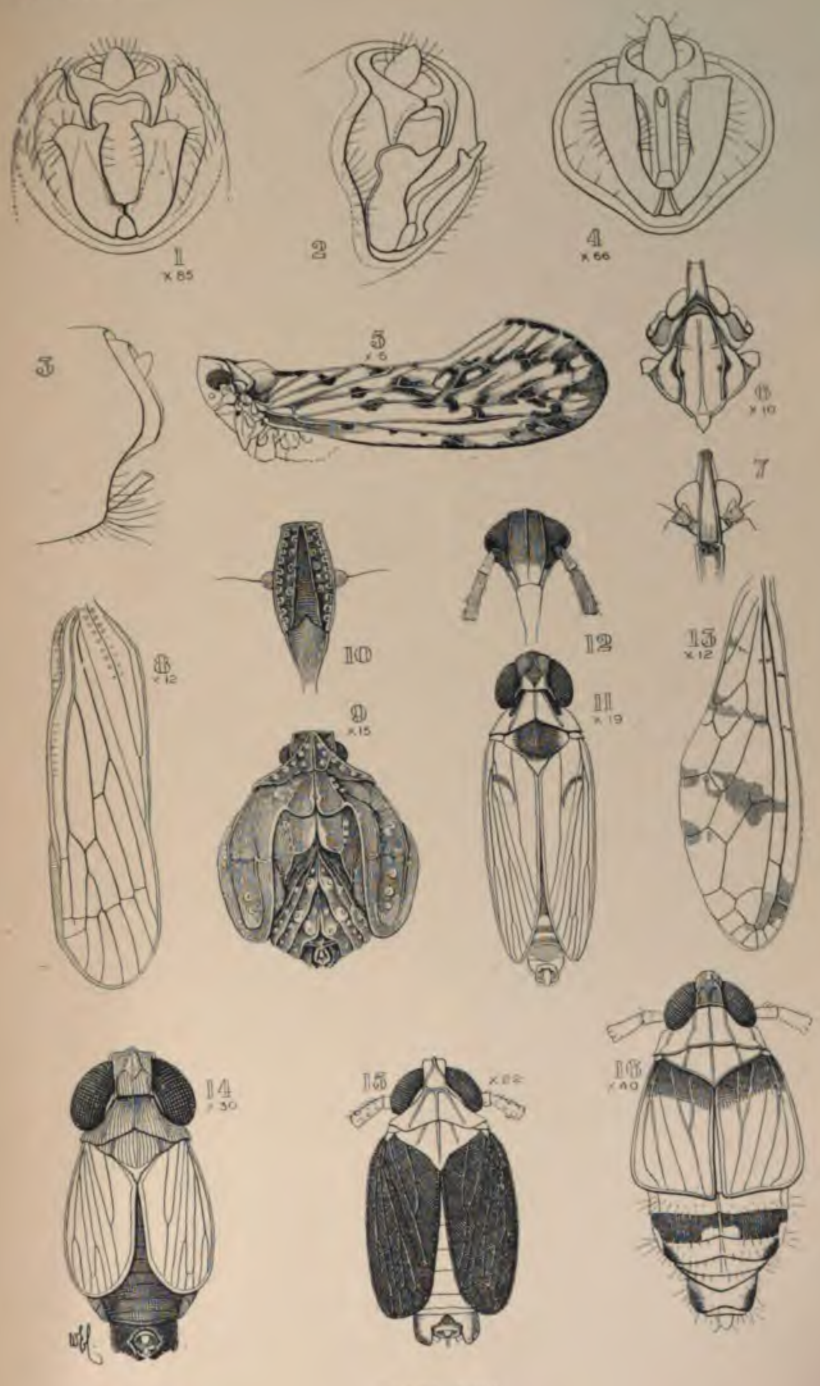

1
x 85
2
4
x 66
3
5
x 6
6
x 10
7
10
12
8
x 12
13
x 12
9
x 15
11
x 19
14
x 30
15
x 22
16
x 40

PLATE XVIII.

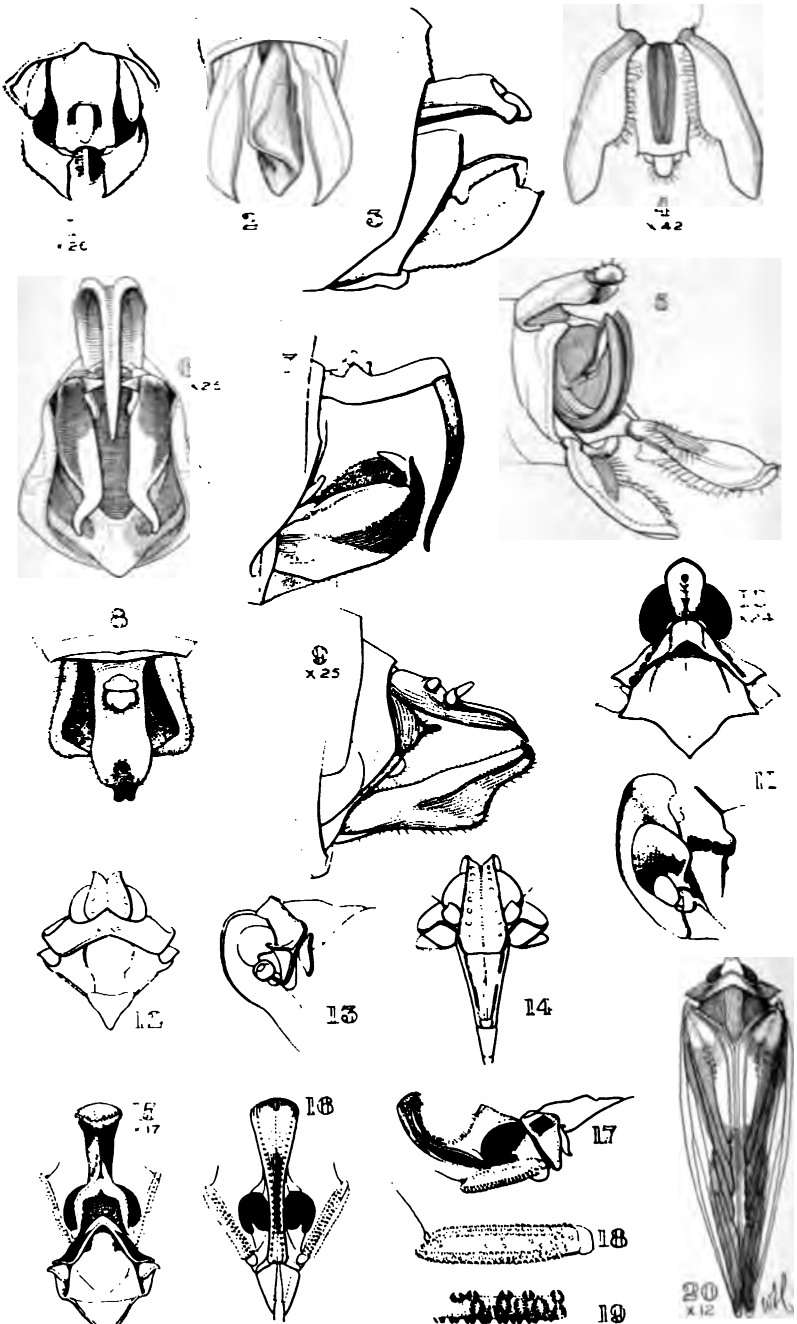
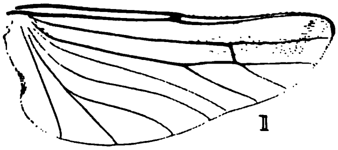


PLATE XIX.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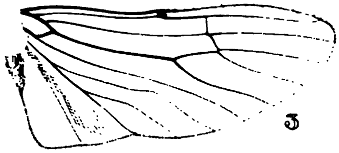
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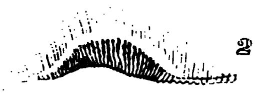
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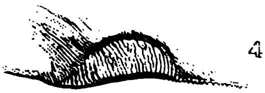
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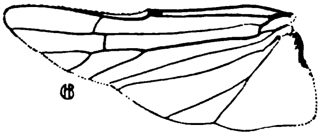
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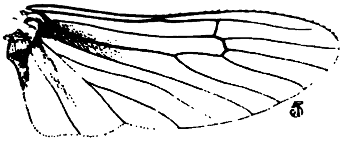
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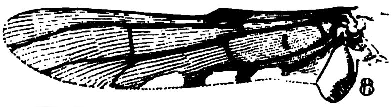
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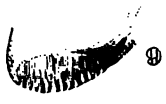
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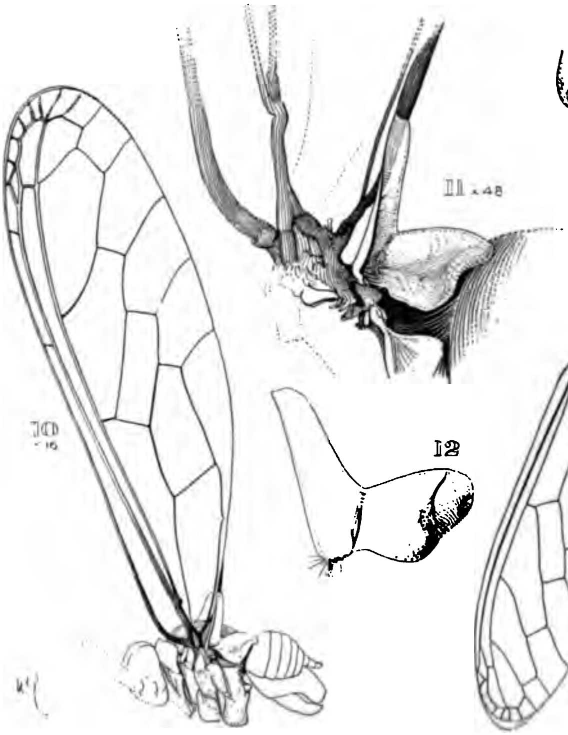

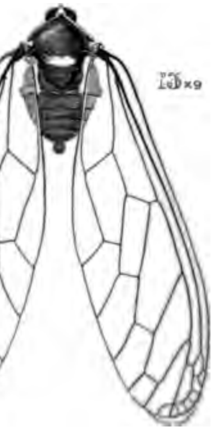
13 ×9

PLATE XX.